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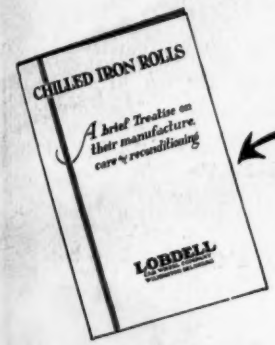

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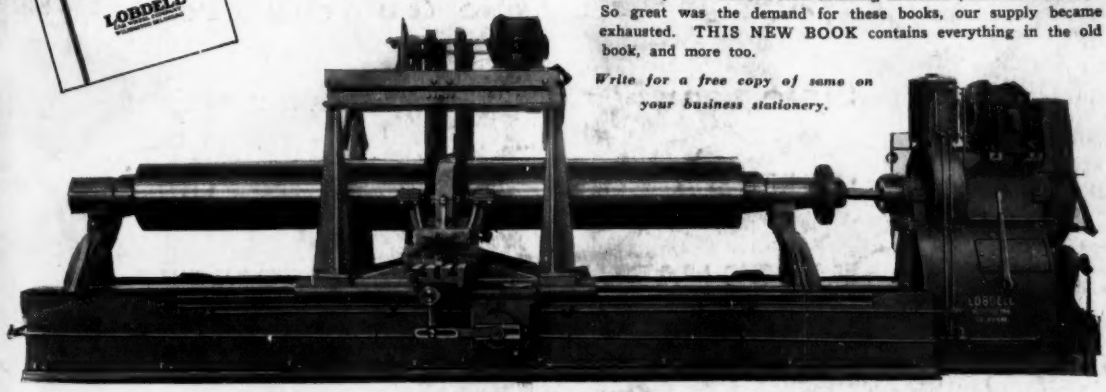

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TITANOX

PAPER TRADE JOURNAL

ESTABLISHED 1872

SIXTY-SECOND YEAR

THE INTERNATIONAL WEEKLY OF THE PAPER AND PULP INDUSTRY AND THE PIONEER PUBLICATION IN ITS FIELD

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THE idea given here is neither new nor startling. But it is so sound and obvious that many young men overlook it. Others have followed it and gone into higher jobs.

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PAPER TRADE JOURNAL

With Which Is Combined

PULP AND PAPER

Vol. XCVII, No. 13 Thursday, September 28, 1933

Paper Machine Code to be Heard October 12

Is Sponsored by the Paper Machine Builders Association Which, It is Claimed, Represents 100 Per Cent of the Industry—Deputy Administrator Malcolm Muir Will Preside at the Hearing in Washington, D. C., on Thursday of Next Week—Code Fixes Minimum Work Week of 40 Hours and Not More Than 8 Hours in Any 24

[FROM OUR REGULAR CORRESPONDENT]

WASHINGTON, D. C., September 25, 1933—The National Recovery Administration has given notice of a hearing on Thursday, October 12, at the Raleigh Hotel, on the code of the papermaking machine builders industry. This code was filed by the Paper Machine Builders' Association, claiming to represent 100 per cent of the industry. Deputy Administrator Malcolm Muir will preside.

The code fixes a maximum work week of 40 hours, and not more than 8 hours in any 24; for those engaged in making the products of the industry, with a tolerance of ten per cent for maintenance, stock-keeping and shipping crews. These limitations would not apply in times of peak demands, which would permit work for 48 hours for any eight weeks in any six months. Beginning October 1, 1933, and each April 1, and October 1, thereafter, time and a half for overtime. Maximum hours not to apply to executives, superintendents and technical engineers, and those receiving $35 a week. Maximum work week for office employees 40 hours on a monthly average, not more than 48 hours in any one week. The minimum wage 40 cents an hour for factory workers. All other employees $15 a week except office boys and girls and those physically disabled, who shall receive not less than 80 per cent of the minimum.

Lease Oswegatchie Pulp Mill

[FROM OUR REGULAR CORRESPONDENT]

GOUVERNEUR, N. Y., September 23, 1933—Announcement is made that the wood pulp mill of the Oswegatchie Paper Company, has been leased to William G. Lewis, of Watertown, and Walter Clinch, of Carthage. The mill has been closed for the past five years and the announcement regarding the lease was made public by Nelson R. Caswell, president of the defunct Oswegatchie Paper Company. The plant is located in the village of Emeryville and is equipped with five grinders having a capacity of thirty tons of ground wood pulp every twenty-four hours. The mill is situated on the Oswegatchie River, a few miles from this city. A force of mechanics are now busy remodelling the plant and it is expected that about 35 men will be given work as soon as the mill is re-opened. Plans call for re-calling many of the old employees who have been idle since the plant was shut down several years ago.

Both Messrs. Lewis and Clinch have been prominent in paper mill circles for some time and their experience is expected to prove of valuable aid. For the past several years Mr. Lewis has been employed as chemical engineer at the Carthage mill of the National Paper Products Company, and previous to that time he was connected with the chemical laboratory of Knowlton Brothers. Mr. Clinch has also been identified with various concerns for the past several years and consequently is well known to the paper mill trade.

Paper Mill Employment Rises

August employment index number for the pulp and paper industry was 88.8 compared with 81.9 for July and 72.2 for August of last year taking 1926 at 100 according to the Bureau of Labor Statistics, Department of Labor. Payroll index number for August was 65.1 compared with 58.4 for July and 46.7 for August of last year.

In the paper box industry August employment was 86.1 compared with 77.9 in July and 66.6 for August of last year. The August payroll index number was 71.5 compared with 65.7 for July and 52.8 for August of last year.

Harrisville Mill Adds Help

[FROM OUR REGULAR CORRESPONDENT]

HARRISVILLE, N. Y., September 25, 1933—A large increase in the working force at the Harrisville Paper Mill has been made and more persons are now being employed than in several months. It is reported that over 100 new employees have been added to the force and indications for a busy winter season are regarded excellent. Orders on hand are understood to be sufficient to guarantee steady work for some time ahead.

Paper Index Numbers Higher

WASHINGTON, D. C., September 27, 1933.—The August wholesale price index number for the paper and pulp industry was 81 compared with 78.1 for July and 76.3 for August of last year taking 1926 at 100 according to the Bureau of Labor Statistics, Department of Labor.

Activities of Fox River Valley Paper Mills

Erection Started on Two 75,000 Gallon Tanks for Interlake Pulp & Paper Co.—Fox River Paper Co. Making Extensive Repairs to Canal—Appleton Woolen Mills to Construct Warehouse—Recovery Program Discussed at Superintendents Convention

[FROM OUR REGULAR CORRESPONDENT]

APPLETON, Wis., September 25, 1933.—With business conditions greatly improved and operations on something like a normal basis, mills are beginning to turn their attention to repairs and improvements. Several projects are now under way.

At the Interlake Pulp and Paper Company, Appleton, Wis., a division of the Consolidated Water Power and Paper Company, erection has been started on two new 75,000-gallon acid tanks, 23 feet in diameter and 30 feet deep. They are to be of long leaf yellow southern pine and will replace tanks which have stood for many years.

The older buildings at the Interlake mill have been reroofed with matched planking and special insulation topped by a built-up felt and tar surface. The exterior of the plant also is being repainted. Twenty-five men have been kept employed on this work.

Appleton Woolen Mills, Appleton, Wis., is contemplating construction of a new warehouse to replace an old structure no longer adequate, according to announcement of F. J. Harwood, president. Work probably will be under way late in October. The addition will be of fireproof construction and will be made large enough to furnish adequate storage space. A crew of twenty men has been at work remodeling the company's power plant, and modernizing it.

Extensive repairs also are being made by the Fox River Paper Company, Appleton, Wis., on its No. 1 canal. The canal was drained about a month ago for the first time in eighteen years. The bottom is being cleaned, and a new concrete wall has been built to replace rip-rap. A new set of track racks has been installed. The work is being done by C. R. Meyer & Sons Company, Oshkosh, Wis., and the cost will run from $8,000 to $10,000. The coffer dam will be removed within about a week so the canal can be refilled.

Paper Mill Superintendents Meet

Grover Keeth, of the Marathon Paper Mills Company, Rothschild, Wis., was elected chairman of the Northwest Division of the American Paper and Pulp Mill Superintendents Association at the Fall convention September 15 and 16 at Rhinelander, Wis. He succeeds Frank Timmerman, of the Northern Paper Mills, Green Bay, Wis. A. J. Loman, of the Marathon company, was appointed secretary. M. J. Ketter, of Green Bay, was elected first vice chairman, and Levi LaRue, of Cloquet, Minn., second vice chairman.

While the business sessions were devoted largely to technical discussions, the superintendents heard an address by Congressman G. J. Boileau, of Wausau, Wis. Declaring that inflation is the key to success in the national recovery plans, he said:

"In my mind, the recovery program will fail unless we do have an expansion of the currency. The inflation bill has the greatest hope of recovery of anything passed by Congress. There has been a change in opinion in recent months. More people are beginning to realize that expansion is necessary to finance business and industrial recovery."

Herbert Randall, of the Champion Coated Paper Company, Hamilton, Ohio, national president of the superintendents, was present and spoke on matters concerning the organization. He also gave a brief address at the closing banquet at Wildwood Lodge.

Institute of Paper Chemistry Opens

Twenty-six students were enrolled when the Institute of Paper Chemistry at Lawrence College, Appleton, Wis., opened last week for the Fall semester. Eleven of these are newly enrolled after graduation from colleges and universities scattered all over the country. These were selected from a large list of applicants as having the qualifications for success in the chemical and research divisions of the paper industry.

The new students are: Robert Elias, Appleton, Wis.; Ralph Atkins, St. Louis, Mo.; Andrew Bixler, Altoona, Pa.; Charles Carpenter, Newark, N. J.; Charles Cassell, Indianapolis, Ind.; T. Alfred Howells, Girard, Ohio; Frank Hurd, Redfield, Iowa; Lemar Moss, Albemarle, N. C.; Robert Ulm, Circleville, Ohio, and Dan B. Wicker, Elon, N. C. All hold one or more college degrees.

News of the Industry

Loading of pulpwood at the Consolidated Water Power and Paper Company's docks at Ashland, Wis., has been completed and all of the wood has been delivered by rail to Consolidated mills. The loading hoist handled thousands of cords rafted across Lake Superior from Canada. The company's tugs have been laid up for the winter after convoying three large rafts this season.

Credit unions have been organized by employees of the Appleton Coated Paper Company, Appleton, Wis., and the carton division of the Marathon Paper Mills Company, at Menasha, Wis. The employees are permitted to subscribe for stock at five dollars a share, and the funds are used for small loans to the workers. Peter C. Jung is president of the Marathon-Menasha Credit Union.

A steady gain in business from early last spring to mid-August and a slight drop and leveling off during the past few weeks, is reported by Appleton Machine Company, Appleton, Wis. The number of employees is now only ten per cent less than the 1929 total.

Recent improvements include installation of a new hydraulic press for the manufacture of super-calender rolls. The plant now has seven roll presses.

In return for the help given him while a young and struggling paper salesman in New York by the late John C. Fogarty, of Green Bay, Wis., James Farley, postmaster general of the United States, has obtained a position in Washington for Mr. Fogarty's son, James P. Fogarty. The young man desired to study law, and Mr. Farley has made it possible for him to do so in Washington. John C. Fogarty was general manager of the Northern Paper Mills and met Mr. Farley during his travels. A small favor done for Mr. Farley resulted in his promotion, and the Postmaster General never forgot the kindness extended him.

J. B. Paper Co. Chartered

[FROM OUR REGULAR CORRESPONDENT]

PITTSFIELD, Mass., September 25, 1933—The J. B. Paper Company, Inc., has been incorporated to deal in groceries, wooden ware, paper and twine, with a capitalization of $1,000; 10 shares $100 each.

Exports of Paper Show Big Gain in Canada

Total Value of Foreign Trade in Wood, Wood Products and Paper Amounts To $13,937,000 In August as Compared with $11,521,000 for Same Month Last Year. Because of More Encouraging Outlook Shawinigan Water & Power Co. Plans Expansion

[FROM OUR REGULAR CORRESPONDENT]

MONTREAL, Que., September 25, 1933—Despite the low price level, Canada had an encouraging month in August in the export of forest products, for the total value of wood, wood products and paper amounted to $13,937,000, as compared with $11,521,000 in August, 1932. Included in the total was an increase in the export of news print, although there was a drop in the total value; an increase in the value of planks and boards from $971,000 in August, 1932, to $2,245,000; an increase in the value of wood pulp from $1,487,000 to $2,656,000; and an increase in the value of pulpwood, shingles and square timber.

Total export of newsprint paper amounted to 331,760,000 pounds, valued at $6,237,054, as compared with 305,521,300 pounds, valued at $7,251,752 in the corresponding month last year, according to a report issued today by the Dominion Bureau of Statistics.

The United States was the best customer, taking 265,704,300 pounds, valued at $5,092,974.

The United Kingdom was in second place with 26,556,400 pounds, valued at $492,172, and Australia was third with 10,551,300 pounds, valued at $231,783.

The output of Canadian news print mills for the month was 194,354 tons, which was the largest monthly total reported since the early part of 1931.

Shawinigan Resumes Expansion Program

A reflection of the improved outlook in the St. Maurice Valley, the center of news print production in Quebec Province, is seen in the announcement of the Shawinigan Water and Power Company of its intention immediately to resume its program of expansion in hydro-electric development. At a meeting of the directors during the past week it was decided to complete the plant at Rapide Blanc so as to make available as early as possible a substantial additional amount of power. In making the announcement the company states that during a period of several months the power load, both primary and secondary, on this company's lines has increased until the demand has reached the highest output in Shawinigan history.

According to Julian C. Smith, vice-president and managing director, the plan to complete the development will mean active construction work during the entire winter months in order to complete the necessary work to bring the plant up to capacity by May 1 of at least 80,000 hp. This work, he states, will employ several hundred people and should be a distinct contribution to the activities in the Province of Quebec during the coming winter.

Mr. Smith further adds that this will be increased by the fall of 1934 so as to make available the complete plant capacity of 160,000 hp. It is pointed out that the carrying out of this work will require no financing on the part of the company as it has on hand the necessary funds required for this purpose.

Coincident with the above announcement is a report of the Dominion Bureau of Statistics showing an increased 11.5 per cent in electrical energy produced in Canada in August as compared with July. August was the fourth successive month in which the daily output was increased over the output of the previous month. Quebec, Ontario, the Prairie Provinces and British Columbia all showed large increases.

Stumpage Rate Cuts Futile

So far the Provincial Government of Quebec has not met the wish of the pulp and paper companies for a further reduction in stumpage rates and there is a strong governmental feeling against reductions. With rising prices in the United States, and the better business conditions expected there in 1934, the Government feeling is that there is no reason why the forests of the province should be cut without something of a substantial return to the treasury, and the returns from this source in the last three years have been very disappointing. The expectations of larger cuts because of lower charges, stumpage and rentals, prove fruitless, and the opinion is that as much wood would have been cut in the last three years as was cut even if the charges had not been lowered. The drop in revenue from the forests has been huge, the receipts last fiscal year being only $2,713,229, approximately two millions less than two years previously, and far from the figure of six millions five years ago.

Wages in Newsprint Mills

During the past week conferences have been held in Montreal between representatives of the Government and the newsprint companies in respect to the question of wages paid to men in the shanties this coming season. The conference was held at the request of the Hon. C. J. Arcand, provincial minister of labor. Following the conference it was announced that no action in the matter of wages would be taken by the government. The lumbering interests, it is learned, have promised to raise wages, but were unable to go beyond a general promise. Since most of the newsprint manufactured in the province goes to the United States, and it is now impossible to know what prices will be paid for the paper made from the wood cut this winter, the companies hold they cannot agree to any scale of wages. A rate of $26 per month was the one mentioned, and is considered a satisfactory one under favorable circumstances.

New Container Plant for Toronto

[FROM OUR REGULAR CORRESPONDENT]

TORONTO, Ont., September 25, 1933—Ideal Containers, Ltd., is the name of a new concern which has leased space in the old Ritchie & Ramsay paper plant in New Toronto for the manufacture of cardboard containers. The company, recently incorporated, is entirely Canadian and has acquired the Canadian manufacturing rights for its products from a United States concern. The containers, of a new type not previously made in this country, are designed for packaging spices, cocoa, drug sundries and semi-liquids. It is stated that the company will be in production at the beginning of October. Directors of the new concern are R. I. Drewery, of Toronto, President; H. A. Hamilton, Toronto, secretary-treasurer, and A. E. Drewery and T. H. Simpson, both of Hamilton, Ont. Machinery is now being installed in the 5,000 square feet of space leased in the Ritchie & Ramsay building.

Demand for Paper Moderately Active in Boston

Fine Paper Market Somewhat Irregular—Wrapping Paper and Kraft Specialties Generally Quiet—Box Board Division Rather Spotty—Most Lines of Waste Paper Dull—Quotations on Several Grades Easier—Bagging Firmer, Due to Rise in Sterling

[FROM OUR REGULAR CORRESPONDENT]

BOSTON, Mass., September 25, 1933—As a whole, it is estimated that the volume of wholesale paper business in September, so far, has not been so large as in August, although in some lines, such as papers for advertising purposes, a fairly substantial amount of merchandise has been moved. The trade is looking forward to more activity in October. In fine papers, last week, the market was reasonably good in some quarters, while in others it was quiet. Some found a little more activity developing. In wrapping papers, the situation was quiet on the whole, although in a few exceptional cases it was reported as "pretty good." These conditions hold also for kraft specialties. What buying developed, both in kraft and specialties was for actual needs. Box board was spotty. Values were steadily maintained, in spite of reports of lower prices which persisted. The Brockton shoe strike, which has continued for a few weeks, pending the settlement of the shoe code, has naturally diminished orders for boards for cartons.

Paper Stock Quiet

Paper stock was rather dull in most lines. In old papers there was very much less demand for the lower grades, such as mixed papers and folded news. Several grades suffered declines. No. 1 mixed papers dropped to .45 @ .50, compared with a former range of .55 @ .60. No. 1 old manila declined to .95 @ 1.05, against 1.00 @ 1.10; print manila was changed to a flat .90 from a range of .87½ @ .92½; box board chips dropped to .45 @ .50 from .55 @ .65, and corrugated boxes to .55 @ .60 from .77½. There has been an influx of West Coast book stock.

Due to a rise in sterling, some grades of bagging increased in price. Heavy wool tares were marked up to 1.15 @ 1.25, compared with 1.10 @ 1.25; new burlap cuttings to 1.15 @ 1.25 from .95 @ 1.00, and heavy baling bagging to 1.60 @ 1.85 from 1.50 @ 1.75.

In new domestic rags, new unbleached shirt cuttings dropped to .05½ from .06. Old domestic rags are practically unchanged. In foreign rags, dark cottons advanced to .95 from .75 @ .85; old fustians to 1.55 @ 1.60 from 1.25 @ 1.55, and old linsey garments to a flat 1.35 from 1.05 @ 1.25.

In the possibility of reduction in cotton acreage, dealers in cotton twine see a possibility of an appreciation in the price of that commodity.

News of the Trade

Carter, Rice & Co., Corp., has added to its stock a bond paper produced by the Collins Manufacturing Company, Holyoke, Mass., which carries the NRA emblem as a watermark, and another line, Goldflake and Silverflake, made by the Strathmore Paper Company, Mittineague, Mass. Goldflake is an ivory paper, dotted with gold specks, and Silverflake is of white stock, speckled with silver spots. These are unusual papers, which may be used for a variety of purposes, particularly for golden and silver anniversary advertising.

At a meeting at the Copley-Plaza Hotel, Tuesday evening, the New England Chapter of the American Paper Mills Supply Institute was formed, with paper stock dealers from various parts of New England present. Samuel Hershman, president of the Institute, who was in the chair, discussed the aims of the new organization, together with its code. P. M. Loddengard, of New York, spoke briefly. The following were elected officers: Harry Schumann, of Braver Healy Company, president; James E. Folsom, of De Stefano & Co., secretary; Richard G. Graham, of James G. Graham & Co., treasurer. The executive committee consists of Robert Graham; Jack Tatleman, of the Lawrence Waste Paper Company; Ben Alper, of Providence, and Dave Barowsky, of Fitchburg. A cooperative committee of the Chapter to work with the paper mills was mentioned and the suggestion will probably be put into effect. The chapter is to look out for the interests of dealers in all New England states except Connecticut. Plans will be completed for another meeting.

R. B. MacDougall, sales manager of the Collins Manufacturing Company, Holyoke, Mass., and Gordon Blanchard, manager of the New York office of that company were in Boston last week, arranging for distributors of the entire Collins lines.

Charles J. O'Brien, a salesman for the Baird & Bartlett Company, box board dealers, was elected one of the vice-commanders of the Grosscup Pishon Post of the American Legion at a meeting of the organization.

The Phillips Paper Company, which specializes in mimeograph paper, has an office at 164 Oliver street, with Paul Richard at its head.

Bids for Government Paper

[FROM OUR REGULAR CORRESPONDENT]

WASHINGTON, D. C., September 27, 1933.—The Government Printing Office has received the following bids for 5,000 pounds of white index paper; R. P. Andrews Paper Company, at 10.38 cents per pound; Whitaker Paper Company, 12 cents; Dobler & Mudge, 12.25 cents; Reese & Reese, Inc., 10.35 cents; Barton, Duer & Koch Paper Company, 11 cents; Mathers-Lamm Paper Company, 12.24 cents and 9.8 cents; Stanford Paper Company, 12.6 cents; Aetna Paper Company, 11.43 cents; Walker-Goulard-Plehn Company, Inc., 10.25 cents less 1 per cent; Old Dominion Paper Company, 12.25 cents, and Perkins-Goodwin Company, 11.4 cents.

The Government Printing Office has received the following bids for 3,000 sheets of gray photo mount board; Whitaker Paper Company, $47.50 per M sheets; R. P. Andrews Paper Company, $56.90; Mathers-Lamm Paper Company, $55.39, $47.92 and $48.90; George F. Muth & Company, $70.00; Charles G. Stott & Company, Inc., $58.00; Reese & Reese, Inc., $46.55; and Milton Bradley Company, $68.58.

Julius Jonas Makes New Connection

Julius Jonas, tax consultant and public accountant, who for the past 25 years has been closely identified with the paper, twine, paper bag, and allied industries, and whose expert knowledge has proved indispensable, is now associated with David J. Levine, certified public accountant, with offices at 370 Seventh Avenue, New York. Telephone numbers are Pennsylvania 6-4488, 4489 and 4490.

Chicago Paper Market Continues Listless

Demand for Various Standard Grades of Paper Slackens Perceptibly—Steadiness Prevails in Fine Paper Section—Book and Cover Papers and Sulphite Bonds Hold Up Well—Position of News Print and Ground Wood Papers Practically Unchanged

[FROM OUR REGULAR CORRESPONDENT]

CHICAGO, Ill., September 25, 1933—Business in the Chicago paper market slackened perceptibly during the past week. It seems evident that the general quietness in other lines has had its effect in buying power. Paper executives here ascribe the slight decline in activity to two factors—first, waning of the first flush of enthusiasm for the NRA, which has not produced a millenium; and second, hesitancy centering around the paper code, as well as other codes now before the NRA board or being initially tested. There is confidence that as soon as the business public realizes that progress will be comparatively slow demand will again increase along with business in general.

Reports from various paper markets show no signs of breaks in any lines and the firmness is taken as a fairly cheerful sign. Sulphite bonds are reported steady as are fine paper lines in general. Newsprint and ground wood papers are little changed. Books and covers show no signs of weakening, though demand is slightly curtailed. The same situation is reported in the board industry. Some mills in certain lines are reported to be running at a reduced rate, the percentage having increased during the week. Waste papers remain about the same.

Paper Merchants Oppose Sales Tax

Members of the Chicago Paper Association have filed a bill of complaint urging the restraining of suits brought by the State of Illinois for the collection of levies of the 2 percent occupational sales tax, recently passed in the State. The complaint, filed September 20, is signed by the Atlas Paper Company; Beier & Company; Chicago Paper Company; J. Chukerman & Sons; Gaul & Ingalls, Inc.; Hanchett Paper Company; Hollis & Duncan; Humboldt Paper Company; Ideal Wrapping Products Company; Inlander-Steindler Company; Levin Brothers Paper Company; Lubin Bros. Paper Company; McNulty Paper & Twine Corp.; Joseph H. Murnane Paper Company; National Paper Company; Peerless Paper Company; Pilcher-Hamilton-Daily Company; Rauth Brothers; Fred Rentz Paper Company; Schwarz Paper Company; J. H. Stone & Sons; Capital City Paper Company and Western Bag and Paper Company.

The fifteen-page complaint contained ten protests against state collection of the sales tax and against the filing of suits to obtain the tax. The complaint avers that the State Finance Department attempt to tax an occupation not properly taxable under the provisions of the act is unfair. It points out that certain phases of efforts of collection make the tax discriminatory and therefore unconstitutional and further avers that the taxing of the products of the complainants results in double taxation as the merchandise in which the various cartons, bags and paper is sold is also taxed. It also states that the intention of the tax was upon the business of selling at retail to ultimate consumers and not to intermediate users thereof.

Direct Mail Exposition

Twenty-two well-known paper organizations are scheduled to exhibit at the Direct Mail Advertising Association's show which is to be carried on in conjunction with the 16th annual conference of that organization, which gets under way at the Hotel Sherman, Chicago, September 26, 27, 28 and 29. Paper firms scheduled to exhibit include the following: Strathmore Paper Company, Butler Paper Corporation, International Paper Company, Paper Makers Advertisers Club, Standard Paper Company, Dill & Collins, Patten Paper Company, American Writing Paper Company, Falulah Paper Company, S. D. Warren Company, Mid-States Gummed Paper Company, Whiting-Plover Paper Company, Blunden-Lyon Paper Company, A. M. Collins Manufacturing Company, Appleton Coated Paper Company, Hammermill Paper Company, Rising Paper Company, Swigart Paper Company, Columbia Envelope Company, Gaw-O'Hara Envelope Company, Heco Envelope Company and the U. S. Envelope Company.

Paper Salesmen Plan Big Outing

The Middle West Division of the Salesmen's Association of the Paper Industry has completed plans for its biggest outing of the year, the final golf and pastimes event at Olympia Fields Country Club, to be held on October 6 in conjunction with the National Paper Trade Association meetings. Every effort is being made to secure attendance of officers and members of associations and of guests affiliated in some way with the paper industry. The association is anxious to make the outing representative of the entire industry and plenty of entertainment will be provided. Efforts are also being made to secure the presence of two high officials in the paper industry at the big dinner program the evening of October 6. Golf arrangements are being made by the industrious Bill Tilden, chairman of the S. A. P. I. golf committee. Mr. Tilden also announces the prize winners at the final regular outing at Westmoreland on September 15 as follows:

Low net, 17 handicap or under, H. F. Leahy, LaSalle Paper Company; low net, 18 to 30, W. N. Gillett, Chicago Paper Company; low net, first 9, Courtney Reeves, Allied Paper Company; low net second 9, Ray Russell, Marathon Paper Company; least number of putts, Jack Burrus, Albemarle Paper Company, and T. F. Donaghue; blind bogey, Ira Meyers, H. Van Patten, R. E. Harbison and Frank Prentiss. High gross, Joe Cunningham, Bradner, Smith & Co.; low net foursome, Ray Russell, Dana Pratt, Jack Burrus and W. N. Gillett. The President's trophy, given for the low net for the final event of the season, went to F. M. Stephens, of the Sorg Paper Company. President Knott awarded an All-Sports watch to Mr. Stephens, but had plenty of fun with the winner before making the presentation. The watch, unbreakable and impervious to water, was thoroughly tested before the anguished eyes of the winner before he got his hands on it.

National Safety Council Program

The National Safety Council reports much interest from the paper industry in the Paper and Pulp Section program of the 22nd Annual Safety Congress and Exposition, to be held at the Stevens Hotel, October 2 to 6. Under the direction of General Chairman J. J. Plzak, of the Consolidated Water Power and Paper Company, the speaking program is virtually completed, as follows: Monday afternoon, October 2, "Past, Present and Future of the Paper Industry", J. J. Plzak; "Data on the 1932-33 Safety Contest", A. Scott Dowd; election of officers and

round table discussion. Tuesday morning, October 3, twenty-minute talks on nip hazards by George Adams, International Paper Company; H. D. Banta, Hoberg Paper and Fibre Company, and R. O. Dickinson, Cornell Wood Products Company. Thursday morning, October 5, "Safe Practices for Maintenance and Repairmen in the Paper Industry", C. K. Boyer, Consolidated Water Power and Paper Company, followed by an "experience exchange", covering new employees, testing, safety news letter and health problems.

Seek Most Beautiful Trees

Where are the most beautiful photographs of trees in America?

The American Forestry Association from its headquarters in Washington, D. C., announces that it will bring them together in a single collection to be exhibited throughout the country for the purpose of stimulating interest in the beauty of trees in the American landscape. The pictures will be placed in competition for cash prizes and certificate awards of excellence.

The competition will be conducted on the basis of national and state awards—cash prizes totalling $450, supplemented by certificate awards, for the most beautiful photographs irrespective of location, and the Association Certificate Awards of Excellence for the most beautiful photograph from each of the forty-eight states. There will be ten national awards and forty-eight state awards.

Awards will be based on beauty in photographic effect, utilizing trees singly, in groups, or in mass. There will be no restrictions as to tree species, season, or location. The competition closes on October 31. Final awards will be made in November by a Jury of Awards, which includes Goerge D. Pratt, president of The American Forestry Association; Dr. John C. Merriam, president of the Carnegie Institution; F. A. Whiting, president of the American Federation of Arts; and Alexander Wetmore, assistant secretary of the National Museum.

According to Ovid Butler, secretary of the association, the collection will remain on exhibit in the National Capital for ten days before being displayed in every region of the country. "There is no better way to stimulate interest in the beauty of trees in the American landscape," he said, "or to encourage photography as a medium of greater public appreciation of their beauty and service."

American Paper Mill Supplies Institute Files Code With N R A

A code for the paper mill supplies industry was filed at Washington by the American Paper Mill Supplies Institute, it was announced at the headquarters of the Institute by Charles J. Browne, its managing director.

The code provides for minimum wages of 35 cents and 25 cents per hour for male and female labor, respectively, in the North, and 25 cents and 22.5 cents per hour for male and female labor, respectively, in the South, except learners for a period of six weeks, who may be paid not less than 80 per cent of the minimum rates prescribed by the code.

Maximum hours of labor are set at forty (40) hours in one week, except chauffeurs, drivers, helpers, engineers and watchmen, who may be permitted to work forty-eight (48) hours in one week.

A code authority to administer the code over the industry is provided for, to be elected in a manner to be approved by the administrator, to provide representation for every branch of the paper mill supplies industry.

Morris Side Suction Pumps

A new bulletin on Side Suction Volute Pumps has just been published by Morris Machine Works, who originated this type of pump and have been developing its design and extending its applications for almost 70 years.

This bulletin describes in detail many recent improvements in the construction of these Morris Pumps, with sectional drawings of motor- and belt-driven horizontal designs, and also vertical designs for operation in wet pit and dry sump.

Various types of drive are illustrated, and complete rating tables are given for pumps driven by belt, motor and steam engine. The typical performance curves included in the bulletin show a non-overloading power characteristic and high efficiency over a wide range of capacity.

These Morris Pumps are built in sizes from 1 to 20-inches for capacities up to 14,000 g.p.m. at heads up to 120 feet, and are suitable for handling clear water and abrasive or pulpy mixtures. They have many applications in industrial plants, chemical plants, pulp and paper mills, and for general pumping or unwatering service.

This new bulletin will be of special interest to plant engineers and contractors, and copies may be obtained by addressing Morris Machine Works, Baldwinsville, New York.

Linen Found in Old Manuscript Papers

The Bureau of Standards found on examination of specimens of papers from some old manuscripts that they were composed largely of linen fibers. As the manuscripts were said to bear dates ranging from 1000 to 1749 A. D., and to be in good condition, they are evidence of the enduring quality of this kind of fiber. The manuscripts were of Arabian and contiguous origin, and this circumstance fits in well with historical evidence that the Arabs used linen largely in the early days of paper making. Their so-called "silk' paper, a thin, smooth paper that was held in great esteem, is said to have been made of linen fiber. History records that the Arabians learned paper making from the Chinese, the originators of paper, through the capture of some Chinese paper makers in 704 A. D.

Condor Whipcord Transmission Belt

A new belt featuring an endless-wound whipcord construction that has no inelastic stretch is being offered by the Manhattan Rubber Manufacturing Division of Raybestos-Manhattan, Inc., Passaic, N. J.

This belt is to be known as the Condor Whipcord transmission belt and was developed after many years of research for high speed, high tension drives which almost invariably require an endless belt.

The Condor Whipcord belt is the continuous-endless-wound type. Its single layer cord section is the equivalent of six dick plies in strength and is many times more flexible.

Confer With Labor at Holyoke

[FROM OUR REGULAR CORRESPONDENT]

HOLYOKE, Mass., September 12, 1933—Conferences were held last week and will be continued the last of this week between Adam Wilkinson, Labor Commissioner for the American Writing Paper Company, Inc., and representatives of the various unions in the paper industry headed by a delegation from Eagle Lodge. Little progress has been made as the code has not yet been accepted and it is not know whether the local mills will work on a 35 hour or 40 hour a week basis. The conferences were of a friendly nature.

Paper Demand More Active In Philadelphia

Sentiment in Local Fine Paper Market Quite Optimistic—Coarse Paper Merchants Report Slight Increase of Orders Over Ordinary Post-Summer Dullness Period—Waste Paper Section Softer, With Quotations on Some Grades Slightly Easier

[FROM OUR REGULAR CORRESPONDENT]

PHILADELPHIA, Pa., September 25, 1933—Increased activity was experienced by both branches of the paper industry during the week. A tour of the fine paper houses showed them reflecting more optimism on the part of the printing and publishing trades—their chief customers—than has been shown for sometime. Large direct-by-mail printing orders are beginning to appear. The coarse paper dealers also reported a slight increase over ordinary post-summer dullness business, and while a few are jubilant, most of them are fairly well satisfied.

The outstanding development of the week in the fine paper branch of the business was one of great importance. It is believed that the axe has been laid at the roots of a long standing abuse. Attention has several times been called in this column to the evils of the credit system as they have developed particularly in recent years. Because of too easy credits—but more because of the lack of uniform treatment of them by the fine paper houses—great loss was occasioned. Many small printers, and just a few of the larger ones, played off one house against another, secured a big line of credit, underbid legitimate competitors and then when failures came, the paper houses and the supply men were the chief sufferers. By unanimity of action, possible at this time, as never before in the entire history of the paper trade in Philadelphia, twenty-five firms constituting virtually the fine paper trade industry in Philadelphia, have unanimously agreed to a credit program which is believed will end past abuses. This program which follows, and which will be placed in the mail during this coming week, provides in brief for a 2 per cent discount in thirty days, and for the establishment of a delinquency list of creditors with unpaid bills at the end of 90 days, to whom no further credit will be given and for whom orders will be filled only on a cash down basis. This is the Philadelphia Plan as adopted by the united fine paper industry of Philadelphia:

"It is generally recognized that many unsatisfactory and unsound practices with respect to the granting of credit now exist in the paper and other trades supplying the purchasers of printing paper. Your own firm may be numbered among the many who have from time to time complained about these conditions and have requested that the paper merchants do something to correct these abuses.

"Having in mind the fact that satisfactory credit conditions in any industry can prevail only when all purchasers are treated alike on a basis that is fair and reasonable to all and in an earnest effort to stabilize credit conditions and to discourage unsound and improper practices that are destructive alike to both buyer and seller, and at the earnest solicitation of a large number of representative houses in the printing and allied trades, we announce the following:

1—The terms of sale now fully established by custom and practice shall continue as heretofore, that is, on running monthly accounts discount of 2 per cent shall be allowed for payment in cash on or before the 15th day of the month following purchase or in the alternative on separate invoices a discount of 2 per cent shall be allowed for payment in cash within thirty days from date of invoice. Payment shall be due net in either event after the expiration of the discount period.

2—If an account remains unpaid on the 21st day of the third month following date of billing the account shall be regarded as delinquent and thereupon further credit accommodations shall be withdrawn until the delinquency shall have been removed by payment in cash. For example, purchases billed during the month of August if not paid by the 21st day of November shall be regarded as delinquent.

3—Appropriate measures shall be taken to institute and maintain a system for the reporting to the various paper houses, for their confidential use, of the facts with respect to delinquent accounts.

4—Accounts that are delinquent shall be required to pay interest.

5—In order that no hardship be caused in any particular instance we are prepared to and will, in appropriate cases, between this date and November 1, 1933, arrange terms of settlement of accounts that are owing for more than ninety days so that such amount due may be reduced gradually and systematically. Accounts with whom satisfactory settlement has not been effected before November 1st, 1933, with respect to amounts owing for more than ninety days, shall be regarded as delinquent at that time. It will be understood, however, that the nature and extent of such settlement and the cases where such an arrangement is warranted shall be within our sole discretion and judgment.

6—Failure to pay any installment agreed upon for the liquidation of present indebtedness, more than ninety days old, shall likewise cause an account to be regarded as delinquent.

"It is our sincere belief that observance of the foregoing statements of policy will help to restore a condition of stability in credit matters in the printing and allied trades which will be mutually beneficial to both the seller and the purchaser of printing papers. We ask for your co-operation in these measures to that end. The signers of this program were the following:

Atlantic Paper Company, 919 Walnut street; Charles Beck Company, 401 North Broad street; Bentley Paper Company, 723 Public Ledger Building; Frank W. Berry Company, 521 Vine street; H. C. Davis Paper Company, Drexel Building; Eagle Paper Company, 116 North 6th street; Garrett-Buchanan Company, 20 South 6th street; A. Hartung & Company, 506 Race street; J. R. Howarth Paper Company, Inc., 804 Sansom street; E. Latimer, Jr., 126 North 4th street; Molten Paper Company, 25 South 6th street; Paper House of Pennsylvania, 32 North 6th street; Paper Merchants, Inc., 140 North 6th street; Penn Card and Paper Company, 410 Race street; Philadelphia Card and Paper Company, 25 North 6th street; Thomas W. Price Company, 503 Ludlow street; Quaker City Paper Company, Inc., 303 Vine street; Raymond & McNutt Company, 9th and Sansom street; Sabin Robbins Paper Company, 15th & Carpenter streets; Satterthwaithe-Cobaugh Company, 217 Chestnut street; Schuylkill Paper Company, Lafayette Building; S. Walter, Inc., 144 North Fifth street; D. L. Ward Company, 401 North Broad street; Whiting-Patterson Company, Inc., 314 North 13th street; Wilcox-Walter-Furlong Paper Company, 17 South Sixth street.

Obituary

Charles W. Ward

BOSTON, Mass., September 25, 1933—Charles W. Ward, widely known in the paper manufacturing industry, died suddenly on Wednesday at his summer residence, Holt's Hill Farm, Andover, Mass. Mr. Ward became associated with the Boston house of S. D. Warren & Co. in 1881, and a partner in the company in 1910. He retired from active participation in the business several years ago. His home was at 67 Colchester street, Brookline.

Mr. Ward was born in Salem, Mass., March 10, 1859, the son of Andrew Abbot and Lucy Ann (Lakeman) Ward. He entered the employ of the First National Bank of Boston in 1877, remaining with that institution for four years, when he associated himself with S. D. Warren & Co. His wife, whom he married April 15, 1890, was Mabel Bruce Saunders, of Salem.

The funeral was held Saturday at the Edward Everett Chapel of the First Church, Boston, with which Mr. Ward was long identified. He was deeply interested in all its activities and at one time was chairman of its standing committee. He was one of the original members of the Brookline town committee, remaining a member to the time of his death. Organizations to which Mr. Ward belonged included the Country Club and the Exchange Club.

His wife, a son, Charles L. Ward, of Concord, Mass., and a daughter, Mrs. Charles C. Kimball, of Andover, are living.

William H. Tait

HOLYOKE, Mass., September 26, 1933—William H. Tait, 64, of 244 Maple street, died Sunday at the Holyoke Hospital after a short illness. He had been employed for 23 years by the American Writing Paper Company, Inc., nine years as superintendent of the Linden Division of that company. Besides his wife he left two brothers, David, of Detroit, and John, of Holyoke. The funeral was held this afternoon at the Martin-Ball funeral chapel. Rev. Dr. John Alison officiated and burial was in Forestdale. He was a member of Mt. Tom Lodge of Masons and the Caledonian Benefit Club, Inc.

Small Paper Roll Manufacturers Organize

Manufacturers of small paper roll products met at the Hotel Commodore on September 12, elected officers and discussed a Code of fair competition for their industry. The small paper roll products industry is comprised of approximately fifty-five converters whose products is valued at between two and three million dollars.

Charles E. Demaree, Eastern Specialties Company of Holyoke, Mass., was elected president and W. K. Gerbrick, Central Paper Company, Menasha, Wis., was elected vice-president.

The executive committee of the Small Paper Roll Association is composed of the following:

M. M. Berger, McKenna & Phelps Company., New York City; G. T. Coughlan, C. E. Perry Company, Boston, Mass.; J. J. Jordan, Ribbon and Ticker Paper Company, Paterson, N. J.; E. J. Latimer, E. J. Latimer, Jr., Philadelphia, Pa.; J. C. Mallalieu, Geo. W. Millar, New York City; Frank A. O'Neil, Paper Manufacturers Company, Philadelphia, Pa.; John Wight, New York & Brooklyn Paper Company, New York.

John A. Kavanagh was elected secretary-treasurer of the organization, which is to be known as the Small Paper Roll Manufacturers Association.

"Quick-Space" Cutter and Trimmer

A new improved cutter and trimmer known as "Quick-Space" has just been announced to the trade by Seybold Machine Company Division of Harris-Seybold-Potter Company, Dayton, Ohio. This new cutter as the name implies, is provided with a quick-acting spacing device which is simple and accurate in its operation, greatly increasing the possibilities of this type of machine.

It is emphasized that this is a "one-man" machine and does not require the attendance of an assistant or a second operator at the rear. The machine is loaded from the front and the work is fed back to the operator quickly and accurately by means of the "Quick-Space." Sequences of cuts, as in tablet and book work, are repeated exactly and at speeds and costs heretofore unattained.

At the side of the Seybold "Quick-Space" Cutter and Trimmer is mounted a gauge board equipped with several rows of adjustable stops. These stops may be set quickly and directly from fixed scales to give any desired sequence of spacing from zero to the size of the machine. A traveling carriage containing automatically controlled plunger stop pins is rigidly attached to the back gauge and the whole easily moved by a conveniently located quick acting handwheel. The entire gauging mechanism is mounted on roller bearings so that it has a remarkably easy movement.

The knife action automatically indexes the "Quick-Space" so as to place the next succeeding stop in position. The operation of the machine is simply that of throwing in the cutting mechanism as in an ordinary cutter and then pulling the back gauge up to the next stop or cutting position. It is not necessary for the operator to read the tape, thus eliminating the element of human error.

Like the "Auto-Spacer" announced some months ago by Seybold Machine Company Division, the "Quick-Space" Cutter and Trimmer is readily convertible to and has all the features and uses of a standard cutter. A simple twist of a small lever places the spacing mechanism out of operation so that set-up runs may be interrupted for general cutting work and then resumed without the necessity of resetting the job.

Other features are foot treadle clamp movements, automatic clamping, three-piece fingered back gauge, steel indication tape for use in general cutting work, safety washer drive, and non-repeat device. The starting lever is of the one-hand two-motion type making for increased safety on the part of the operator. A shielded light is provided for illuminating the scale and the working portion of the table immediately below the knife and clamp. The entire mechanism of the machine is fully enclosed within the massive one-piece frame, yet all parts are readily accessible.

The entire machine is of unusually rigid construction—smooth and quiet in operation. It is fast and remarkably simple and easy to operate.

Buys Smith-Lewis Fiber Can Corp.

[FROM OUR REGULAR CORRESPONDENT]

ONEIDA, N. Y., September 25, 1933—Announcement was made last week by officials of the Smith-Lee Bottle Cap Company that negotiations have been completed for the purchase of the business of the Smith-Lewis Fiber Can Corporation, of Lowville. Removal of the Lowville concern is expected to take several weeks and will result in a large increase in manufacturing activities at its local plant. Plans for increasing production are already under way and officials announced that more than 200 workers would soon be employed. The enlargement of the force will also result in a large increase in the payroll.

Indianapolis Demand Expands

[FROM OUR REGULAR CORRESPONDENT]

INDIANAPOLIS, Ind., September 25, 1933—Continued expansion in demand, slight though it be, features the local paper market. The coming of cooler weather has done much to help the trade with the exception of summer specialties which, of course, have fallen off to nearly nothing. Opening of the colleges this week stimulated demand on the part of retailers for finer grades of paper and reorders are coming into the jobbing plants for the reason that retailers were not stocked too heavily.

A settlement of the paper code will do much for the industry. Many factories are drifting along as best they may under the emergency code, making as few moves as possible until something definite is determined with regard to the submitted code. Most of the plants report a fair volume of orders and most of them are working either at or nearly to capacity. It is believed a final settlement of code provisions will cause an impetus in production.

Jobbers in transparent papers report an increasing demand. Not only have old customers increased their needs but new sources are being found daily for these papers. The waxed paper demand also is good. Makers of paper for the baking companies are jubilant over the outlook. It is doubtful if there is a wholesale bakery in Indiana now that is not wrapping its bread. About the only naked loaves that can be found are those baked by the smaller retail bakeries.

Container factories continue on a good production basis. In many instances these factories, because of increasing orders, have found it impossible to build up their warehouse stocks, which already were sadly depleted before business assumed any turn upward. Even if there were a temporary lull in orders, most of these plants would continue production for a time to replenish their warehouse stocks.

Demand for news print shows some increase the past week. Cooler weather caused the local advertisers to open their fall seasons with a rush to make up for the lack of advertising done during extremely warm weather the first part of September.

Cellophane Bags for Silverware

A new, efficient and inexpensive protection for silverware against tarnish and rust, has been made available with the introduction of "Artiks," transparent, moisture-proof cellophane bags, in special sizes for silverware. "Artiks," which are made by the United States Envelope Company, have been sold for some time in larger sizes for preserving moisture in foods. They are equally efficient in the care of silver to protect it from tarnish.

Tarnish is a discoloration caused by the action on silver of hydrogen sulphide, of which there is always a slight percentage in the air. As every woman knows, this means frequent cleanings, a particularly unpleasant kind of work and, in the case of plated ware, gradually wear away the silver plate. After repeated cleanings, when the plate has been worn too thin, the metal beneath is exposed to the moisture in the air and rust begins to form.

"Artiks," by test, are a most efficient method of protecting silver or silver plated articles from air and moisture and hence from the two household bugbears, tarnish and rust. They save both labor and the life of the silver. They come in packages of twenty-five, enough to hold twenty-five knives, forks or spoons packed singly, or seventy-five pieces is nested three to a bag. Larger pieces and hollow ware may be kept in the regulation size "Artiks." As each can be used over many times, the cost is amazingly low.

Singing Praises of Superintendent

BECKET, Mass., September 25, 1933—"While this town may be joining in the chorus of praise of President Franklin D. Roosevelt's recovery plans, it has reserved a considerable portion of its acclaim for a man who has helped in no uncertain way to keep hands at work in Becket and Bancroft," says the *Berkshire Evening Eagle*.

Arthur J. Thompson, superintendent of the Bulkley & Dunton Union Mill at Bancroft, is one of the most popular men in town. Many a charitable deed done during the depression has won him friends.

"In 1920 Mr. Thompson was the youngest paper mill superintendent in the country. His first position as superintendent was with the Crystal Tissue Company of Middleton, Ohio, at the age of 26. This factory at that time was operating the widest tissue machine in the world, trimming a sheet of tissue paper 10 feet wide. He had 300 men under him there. Two years later he resigned to take charge of Robertson Brothers' Hinsdale (N. H.) division. After six years with this company he resigned and accepted the position as superintendent of Union Mills, Inc., in this town, owned by the Buckley, Dunton company of New York.

"When he first came to Becket there were but 15 men working in the mill. At present he has 35 employees and for the year 1932 the payroll amounted to $41,328.86. During the worst of the depression he had the mill running on better than half time and since the first of the year Mr. Thompson has had the mill running five days a week, 24 hours a day.

"In 1931, by request of his employees, he entered local politics and was elected a member of the Board of Selectmen and Welfare Board. In 1932 he declined to run but was persuaded by his employees and friends and was elected by what is said to be the largest vote ever given a candidate in Becket.

"This is Mr. Thompson's 10th anniversary as superintendent of the Union Mill and not only his employees but townspeople as a whole hope that he will celebrate many more anniversaries with the Union Mill."

Paper Directory of All Nations

The Paper Makers' Directory of All Nations, published by Dean & Son, Ltd., of London, England, has just been issued. This directory is arranged in three sections, the first containing particulars concerning the paper and board mills in Great Britain and Ireland, together with many useful lists, such as those of wholesale stationers and paper merchants, waste paper, rag and paper stock dealers, cardboard box manufacturers, China clay producers and merchants, paper bag makers, paper agents (with mills represented), export merchant shippers of paper, etc.; the second, similar details regarding the paper, pulp and board mills of foreign countries and the Dominions; and the third, a comprehensive list of mill productions arranged alphabetically in three ways: (1) as to class of goods manufactured under more than 400 trade headings, (2) as to country of origin, and (3) as to name of firm.

The "Classified Index to Commercial Prospectuses" forms a most useful and convenient International Buyers' Guide for those having purchasing control in mill, factory or other business, as it is arranged under many trade headings by the classification of names of advertisers situated not only in the British Empire, but also in many other countries.

The Paper Makers' Directory of All Nations may be obtained from the Lockwood Trade Journal Company, Inc., 15 W. 47 street, New York, at $7.50 per copy.

CONSTRUCTION NEWS

A Summary of Vital Facts Regarding Construction, Finances and Operation of Paper Mills

Construction News

Wellsburg, Va.—The S. George Company, Railroad street, manufacturer of paper bags and sacks, has awarded contract to the Austin Company, Union Trust Building, Pittsburgh, Pa., engineer and contractor, for new addition to plant, recently noted in these columns, to be two-story, 110 x 153 feet, estimated to cost close to $90,000, with equipment. Superstructure will be placed under way early in October.

Gorham, N. H.—Brown Company, Berlin, N. H., is making improvements in equipment at its Cascade Mill at Gorham, including replacements in certain machinery, and it is proposed to resume operations at the plant in October. The mill has been closed since May 1931. A large working force will be employed.

Chatham, N. Y.—The Columbia Box Board Mills, Inc., has arranged for increase in capital from $80,000 to $130,000, for general expansion.

Grand Rapids, Mich.—The American Box Board Company, manufacturer of box boards, test liners, etc., has work under way on new one-story addition to mill, and proposes to have structure ready for occupancy at an early date. No estimate of cost announced.

New York, N. Y.—The Astor Paper Box Company, Inc., recently organized with capital of $20,000, plans operation of local plant for the manufacture of paper boxes and containers. New company is represented by Irving D. Korn, 401 Broadway.

Indianapolis, Ind.—The Ostermeyer Paper Company has removed from 148 Virginia street to larger building at 219 West South street, totaling about 15,000 square feet of space, to be used for local storage and distributing plant. Considerable increase in facilities will be arranged at new location.

Garwood, N. J.—The Sonoco Products Company, Inc., 709 West Front street, Plainfield, N. J., manufacturer of paper board products, paper tubing, etc., has awarded general contract to the Wigton-Abbott Corporation, 143 Liberty street, New York, N. Y., for improvements and changes in former No. 3 plant unit of the Aeolian Company, North avenue, Garwood, recently acquired for a new mill, as noted in these columns a few weeks ago. About 100,000 square feet of space will be available at the new location, all of which will be used by the company, which will remove present Plainfield works to new site, expanding and concentrating production here in the future. Improvements program is reported to cost over $30,000. Additional equipment will be installed. Main plant of company is situated at Hartsville, S. C.

Chicopee, Mass.—The Craftsman Folding Box Company, Inc., recently chartered under state laws with capital of 100 shares of stock, no par value, plans early operation of local plant for the manufacture of folding paper boxes and containers. New company is headed by Mark H. Robinson, president, and Morton E. Harris, 22 Villa street, Longmeadow, Mass., treasurer. Last noted is also company representative.

Chillicothe, Ohio—The Mead Corporation is said to have tentative plans under consideration for a new filter plant unit at local mill, including pulp storage tanks and auxiliary equipment. Proposed to begin work in near future. No estimate of cost announced.

Kalamazoo, Mich.—The Sutherland Paper Company is operating on a higher production schedule, with increased working quota. Since early in July, the company has added about 400 workers to the force. A 40-hour week schedule has been adopted to conform to the temporary code adopted for this branch of manufacture. Over 1200 persons are affected by the change from a 48-hour week, as heretofore.

Manchester, N. H.—The J. F. McElwain Company, Manchester, shoe manufacturer, has concluded arrangements for purchase of local plant of the A. Dalton Box Company, Silver street, manufacturer of cardboard boxes and containers. New owner will continue the factory in operation for the production of cardboard shoe boxes, developing a capacity schedule at early date.

Newark, N. J.—The Pavey Envelope and Tag Company, 36 Green street, commercial envelopes and other paper goods, paper tags, etc., has leased a one-story building to be erected at 8-10 Baldwin street, on site 38 x 100 feet. Present old structure will be razed at once on new unit placed under way. Pavey company will occupy for a new storage and distributing plant, removing from present building to new location as soon as structure is completed.

Kalamazoo, Mich.—The Kalamazoo Vegetable Parchment Company, Parchment, near Kalamazoo, has plans for construction of a new building at its mill, to be three-story, 60 x 225 feet, estimated to cost about $40,000, with equipment. It will be used primarily for storage and distributing service. As recently reported in these columns, company is planning extensions and improvements in power plant at mill, with installation of additional equipment.

St. Hyacinthe, Que.—The Richelieu Paper Box Company, Ltd., has tentative plans under way for construction of a new plant unit for manufacture of paper boxes, folding paper containers, etc. It is reported to cost close to $35,000, with equipment.

Drummondville, Que.—Canadian Celanese, Ltd., manufacturer of cellulose rayon products, is planning an expansion program at local mill, with installation of additional equipment to provide for about 25 per cent increase in present capacity. The plant has been running on peak schedule for a number of weeks. Expansion program is reported to cost over $75,000.

Edmonton, Alta.—The Western Straw Paper Com-

pany, 10638 Ninety-first avenue, G. K. Guild, head, is considering early establishment of a new one-story plant unit for strawboard and straw paper manufacture, reported to cost close to $30,000, with equipment.

New Companies

Brooklyn, N. Y.—The Rabkin Paper Company, Inc., has been organized with capital of $33,000, to manufacture and deal in paper products of various kinds. The incorporators are Benjamin Marcus and Philip H. Wellman. Company is represented by Samuel D. Johnson, 11 West Forty-second street, New York, attorney.

Rushville, Ind.—Novelle Art Works, Inc., has been incorporated with capital of 1100 shares of stock, no par value, to manufacture paper novelties, ornamental paper goods, etc. The incorporators are Henry Kuhn, Orland F. Ingle and Wallace Morgan, all of Rushville.

New York, N. Y.—The Fibrox Manufacturing Corporation has been incorporated with capital of 100 shares of stock, no par value, to manufacture paper boxes and containers, paper tubing and kindred products. The incorporators are Edward P. Shanley and Philip E. Donlin, 72 Wall street, New York. Last noted is representative.

Buffalo, N. Y.—The Fillmore Paper Stock Company has filed notice of company organization to deal in paper goods of various kinds. John Wargo, 117 Rutland street, is head.

Los Angeles, Cal.—The American Paper Company, 2652 West Pico street, has filed notice of company organization to deal in paper products of different kinds. Company is headed by M. G. Monteleone, Jr., 1725 North Normandie avenue.

Chicago, Ill.—The Paramount Paper Tube Company, 2035 West Charleston street, has been incorporated with capital of 100 shares of stock, no par value, to manufacture paper tubing and kindred paper products. The incorporators are W. M. Griffin and Robert J. Jauch.

New York, N. Y.—A. Corenman, Inc., has been incorporated with capital of $5,000, to deal in paper products of various kinds. Alter Corenman, 56 West 180th street, New York, is principal incorporator. Jacob Linett, 17 John street, attorney, is representative.

Hartford City, Ind.—The Hartford City Paper Company has filed notice of company reorganization, with capital of $300,000 common stock, and $90,200 preferred stock.

Brooklyn, N. Y.—The Watkin Paper Company, Inc., has been incorporated with capital of $20,000, to deal in paper goods of different kinds. The incorporators are Michael L. Marcus, 947 Montgomery street, and Joseph Silverman, 318-A Sutter avenue, both Brooklyn.

Work of the Import Committee

Attorneys formerly in the office of the Assistant Attorney General in charge of customs are now, since the change of administration, practicing in the Customs Court on behalf of importers, according to reports of trials of paper cases in various cities coming to the Import Committee of the American Paper Industry.

"The Import Committee has always sought for a correct interpretation of the tariff laws, and no more," says Warren B. Bullock, Manager of the Import Committees, "and the importers are entitled to the best talent they can secure in trying these cases. On the other hand the Import Committee is continuing to provide the Government with all the technical information at the command of the paper industry in its effort to secure the strict enforcement of existing laws as written. The new men in the Government service are working vigorously in the efforts to become acquainted with their new tasks, and are endeavoring to prove themselves at least the equals of the able men who have preceded them in this branch of the Government service.

The Import Committee reports that an appeal has been taken to the United States Court of Customs and Patent Appeals from the decision of the Customs Court on the dutiable value of Swedish kraft wrapping paper. The customs officials had held the paper to be dutiable at a value about 1 cent per pound higher than that claimed by the importers. The lower court decided, in view of testimony that the jumbo rolls sold for export were not sold in Sweden, where the customary size was testified to be counter rolls, the paper for export was dutiable at a lower value than that sold in the home market. Pending the decision of the higher court, all imported paper will be forced to pay the higher rate of duty.

The economy program at Washington is already throwing added work on the Import Committee which has been notified that data which could formerly be secured on foreign shipments can no longer be provided because of the decreased personnel available.

Investigation is being made of low priced offerings of standard news print and canary news at Chicago, Norwegian paper being offered at about $30 per ton, delivered at Chicago. Canary news is being offered duty paid at less than $40 per ton, also from Norway. These figures would reduce to about $23 per ton f.o.b. mill, which is apparently below any possible cost of production.

A case initiated by the Import Committee in 1926, has at last been decided by the United States Customs Court. Waxed printed paper labels were claimed to be dutiable at 3 cents per pound and 15 per cent as wax coated paper, but were classified by the Customs officials as being something more than paper, and held dutiable at 5 cents per pound and 20 per cent as manufactures in chief value of coated paper. As a result of this action, now decided after seven years, the importation of waxed paper in all printed forms was stopped.

A case instituted in 1930 involving the dutiability of Japan paper was decided adversely to the importer, as a result of the action taken by the Import Committee. The paper was claimed to be dutiable as printed (book) paper at ¼ cent per pound and 10 per cent, but was held to be dutiable at 3 cents per pound and 15 per cent under the writing paper provision of the Tariff Act, which includes Japan and similar papers.

Ontario Paper Box Makers Play Golf

[FROM OUR REGULAR CORRESPONDENT]

TORONTO, Ont., September 25, 1933—Responding to an invitation sent out by the paper box manufacturers of Hamilton, Ont., to their confreres throughout Ontario, about forty golf players gathered on the links of the Burlington Golf and Country Club. The winner was Howard Small, of Guelph, son of J. J. Small, past president of the Canadian Paper Box Manufacturers' Association, with a net score of 67. William Hampel, of the Hamilton Paper Box Company, Brantford, took second place with a score of 69, net, while W. J. McIntyre, of Gummed Papers, Ltd., and F. W. Fisher, of the Fisher Paper Box Company, Toronto, rang in on the back door money. A horseshoe tournament was another feature of the day's outing, M. Knowles, of Tressidor Bros., Hamilton, and Jack Eagen, of the Hamilton Paper Box Company, carrying off the honors. The runners-up were W. T. Filey and J. H. Northey. The players met at dinner in the evening as the guests of C. C. Reid, when the prizes were presented.

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NEW WOOD PULP RAW MATERIAL

A huge new source of material for the Southern newsprint industry has been discovered through experiments of the Georgia Pulp and Paper Laboratory, Savannah, Georgia, it was announced by Dr. Charles H. Herty, research chemist and a member of TAPPI, in an address to the naval stores section of the Savannah Chamber of Commerce.

The new source is pine trees under nine inches in diameter, which have been worked for a few years by naval stores operators and discarded. Too small for lumber, the trees have been considered worthless, but the experiments at the paper laboratory have shown that the unscarified portions of the trunk above the "chipping surface," is suitable for the production of news print.

Dr. Herty estimated that this would make available six and one half million cords of pulp wood, valued at 19.5 million dollars, and not heretofore taken into consideration as a source of material for news print.

Through the courtesy of Daniel Warnell of Pembroke, Georgia, a supply of trees was furnished to the Laboratory in 8 foot lengths above the turpentine face. These logs averaged 7 inches in diameter and were 16 years old. They were long leaf and slash pine and were readily converted into groundwood and sulphite pulps and excellent sheets of white standard news print were produced by the usual commercial methods.

At the present rate of production of naval stores three-quarters of a million cords of pulp wood will become available each year. This waste material would provide sufficient raw material for 25 per cent of the total news print consumed annually in the United States.

Plans for a new and fairly complete survey of Southern pine forests has been recently approved by President Roosevelt. This will produce authoritative information regarding the long leaf and slash pine resources of Georgia, Florida, Alabama and other naval stores producing states. It will cover data on the annual growth to make possible a sound and conservative reforestation program and proper utilization of naval stores, pulp, paper, lumber and other forest products.

OUTLOOK DEFINITELY FAVORABLE

Neither the recent reaction in business nor the practical difficulties of the NRA program necessarily indicates that progress toward recovery is not being made is the opinion expressed in a survey of business conditions that has just been completed by the Guaranty Trust Company. On the contrary, setbacks and controversies were recognized from the beginning as inevitable; and the contrast between present conditions and those that existed six months ago leaves little room for doubt that a genuine upward thrust has occurred. If impatience can be curbed and dangerous political influences held in check, the outlook may be regarded as definitely favorable.

Increasing attention has recently been given to the problem of stimulating the output of, and the demand for, producers' goods. This question has been brought forward partly as a result of the NRA program, which is designed primarily to increase consumers' demand. It has been pointed out that consumers' demand alone can hardly form the basis of a true industrial recovery—at least, not within the near future—inasmuch as a large part of the existing industrial equipment is suitable only for the production of further industrial equipment. In other words, the modern industrial mechanism is so designed that it can operate at a high level only in a situation permitting a rapid growth in the total supply of capital goods. The steel and construction industries are outstanding examples of the many important branches of business that depend for their markets, to a large extent, on industrial expansion, rather than current consumption. Consequently, even if purchasing power could be so distributed as to enable consumers to take a greatly increased amount of consumption goods off the market, a large proportion of the aggregate plant capacity could not participate in the production of such commodities.

This view is in accord with some of the most widely held theories of business cycles. It is well known that the production and consumption of consumers' goods vary comparatively little. The wide differences between rates of output during prosperity and depression are due, for the most part, to variations in the production of buildings, machinery, tools, and other productive equipment. All this productive equipment, of course, can be used only to produce goods directly or indirectly for the ultimate consumer. According to several authoritative and widely accepted theories, it is the tendency of productive equipment in times of prosperity to expand too fast—that is, beyond the capacity of consumers to absorb the output—

which constitutes the principal factor operating to terminate prosperity and bring on depression. It has been estimated that the industries producing capital goods represent, roughly, half of the country's productive capacity and that in 1929 the total production of such goods amounted to about $40,000,000,000, as against $30,000,000,000 in consumption goods.

Recent developments in the business situation tend to emphasize the extent to which the more pronounced recessions have been confined to the basic industries. Both wholesale and retail trade appear to have been comparatively well maintained, although recent gains are admittedly due in large measure to seasonal influences.

Among the directions in which decreased activity has been noted are steel production, automobile output, cotton textiles, lumber, and bank debits to individual accounts. Railway freight traffic has increased irregularly, but hardly by the usual seasonal amount.

Department store sales, on the other hand, according to a preliminary index, increased from July to August by considerably more than the estimated amount. The index for last month stands at 75, as against 71 a month earlier and 68 in June.

Sales of cotton textiles, after an abrupt decline following the application of the code and the processing tax, have advanced sharply in the last few weeks. Commission houses report large volumes both in cotton and woolen goods and anticipate a continuance of active business for some time.

An encouraging feature of the situation in recent weeks has been the growing number of corporate dividends resumed or increased. While the movement has not yet become by any means general, it has been substantial enough to attract comment. The tendency is significant as an indication that some companies have experienced an improvement in their business sufficiently marked and sustained to be reflected in earnings and to inspire some confidence regarding future trends.

Another favorable development is the consistent decline that has ocurred in business failures. Improvement in this direction has been visible for several months, with the result that the total number of failures for the year to date makes a conspicuously favorable comparison with that of last year, when conditions were particularly difficult.

Veldown Co. Shows Big Increase

GLENS FALLS, N. Y., September 25, 1933—Officials of the Veldown Company report greatly improved business conditions which have resulted in an enlargement of the working force. Business during the month of August showed a seventy percent increase over a corresponding period of last year, according to announcements, and a further increase is looked for within the next few weeks. About 50 new employees have been added and the plant is experiencing an unprecedented rush of business for this time of the year. An increase in wages was placed in effect a few weeks ago and announcement was made that the company is co-operating in every way with the terms of the Recovery Act.

Appeal for Lower Hydro Power Rates

[FROM OUR REGULAR CORRESPONDENT]

TORONTO, Ont., September 25, 1933—An appeal from Port Arthur and Fort William for lower hydro power rates will have to be decided by the Ontario Hydro Electric Power Commission, Premier George S. Henry told representatives of the industries of the two cities, in Fort William, who sought lower rates in order that some of the idle pulp and paper mills at the Head of the Lakes might resume operations.

The contention advanced by the local interests was that the Nipigon power plant, supplying the Thunder Bay area, had been built by Hydro at a time when costs were high, and that, owing to curtailment of business, a considerable amount of power was going to waste. For this reason, it was claimed, the present rates were out of line with conditions and with prices obtainable by the mills for pulp and paper.

If the rates were lowered, it was predicted, the Head of the Lakes mills would be able to recapture the lost United States market for pulp and paper and compete with the European products now finding their way up to Middle-West cities.

Hydro charges were based on costs, the Premier and the Hon. William Finlayson, Minister of Lands and Forests, told a group which interviewed them at the Fort William City Hall. They were unable to see, offhand, how reductions could be made without similar concessions all over the Province, which would throw the whole Hydro financial set-up out of gear. However, they advised the cities to take the matter up with the Hon. J. R. Cooke, chairman of the Hydro Commission, so Mr. Cooke will be invited to Fort William at an early date.

While the prospect of concessions on power charges is slim, Mr. Finlayson told the deputation, the Government was considering assisting wood operations of the timber and pulp companies this year by reduction in the timber dues and stumpage.

L. A. Furlong To Be Manager of Sales

The Minnesota and Ontario Paper Company, Minneapolis, Minn., announces that L. A. Furlong has been appointed manager of paper sales. Associated with him are men who have been with the company for a number of years, in various departments. All of these men are thoroughly versed in the work of their respective assignments, know the company's objectives, appreciate its determination to render first class service and understand its policy to think out helpful suggestions to be given to its customers and prospective customers to the end that the industry and, therefore, the company, may be the beneficiaries of such constructive endeavor. Their names follow:

R. O. Warner, assistant to sales manager, will, in addition to his sales work, be directly responsible for the handling of sales correspondence; service to publishers and consumers.

C. S. Hansen, assistant to Mr. Warner, will have charge of orders for newsprint, kraft and other paper products.

W. J. Hilvers, newsprint salesman, will be in the field contacting the trade.

H. J. Cerney, newsprint service, will have headquarters at Kansas City, Mo., and be in the field contacting the trade.

H. J. Ratelle, newsprint service, will have headquarters at Minneapolis, Minn., and be in the field contacting the trade.

J. W. Magers becomes newsprint representative with duties covering the company's relations in the newsprint sales field.

CASEIN

(DOMESTIC & IMPORTED)

We have recently completed a new casein plant at Warners, N. J. and are now in position to serve you from this additional shipping point.

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ROSIN SIZE
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Pulp and Paper Industry Literature Review

Abstracts of Articles and Patents Compiled by the Abstracts and Bibliography Committee of the Technical Association of the Pulp and Paper Industry, A. Papineau-Couture, John F. Ohlson, C. E. Peterson and Clarence J. West, Chairman

Copies of United States Patents can be obtained from the United States Patent Office, Washington, D. C., for 10 cents each. Send currency, not stamps.

Pulp and Paper Testing

Outlet for Fiberous Materials for the Manufacture of Paper and Board. Linke Hofmann Busch Werke Akt. Ges. Bad Warmbunn. Ger. pat. 557,097 (Sept. 29, 1930). —J. F. O.

Process for the Manufacture of Material for Building Insulation and Other Uses from Fibers (Straw). A. Bol. Svenska Maskinverken, Sodertalje, Swed. pat. 73,908 (June 1, 1928).—Straw is mechanically defibered, treated with water and steam under pressure, kollerganged, and then mixed in the beater with sodium hydroxide, size and water glass. This mixture is then made into sheets of 50 to 100 mm. thickness.—J. F. O.

Process for the Manufacture of Material for Insulation and Building Purposes. H. C. Ingeberg, & A. Verterlid, Trondheim, Norway. Swed. pat. 73,909 (Dec. 8, 1928).—Straw is mechanically treated at the proper consistency in a beater or kollergang, or by the release of pressure, mixed with certain quantities of pulp and made into sheets.—J. F. O.

Process for the Manufacture of Photographic Film. Cinematograph and Photographic Films, Ltd., Gand, Belgium. Finn. pat. 14,239 (Oct. 8, 1929).—The film consists of a gelatine emulsion sensitive to light spread out on a base of transparent wood pulp paper.—J. F. O.

Properties of Newsprint Paper of Various Qualities. Togo. Wochbl. Papierfabr. 63, No. 46: 845 (Nov. 12, 1932).—An enumeration of the various physical properties and printing qualities of newsprint.—J. F. O.

Insulation Materials of Paper Impregnated with Artificial Resin. Wochbl. Papierfabr. 63, No. 53: 970 (Dec. 31, 1932).—Description of the process, the artificial resin preparation, the quality of paper, and the conditions for the fabrication of the insulating materials.—J. F. O.

Process and Arrangement for the Impregnation of Fiberous Webs. I. G. Farbenindustrie Akt. Ges. Frankfurt a.M. Ger. pat. 560,324 (March 2, 1929).—Webs of fiberous materials, such as textiles, felts of fiber, paper and similar materials are impregnated with solution of colloids in organic solvents in such a manner that they are free from air bubbles.—J. F. O.

Process for the Production of Pulp Impregnated with Sulphur. F. N. Burt Company, Ltd., Toronto, Canada. Ger. pat. 559,202 (March 6, 1927).—J. F. O.

Process for the Treatment of Plant Fibers. I. G. Farbenindustrie Akt. Ges. Frankfurt a.M. Ger. pat. 561,416 (Nov. 21, 1930).—It has been found that treatment of plant fibers or textile with sulphuric acid of high percentage is advantageous for the preparation of special effects. —J. F. O.

Covering or Wrapping Material, Especially Paper. Chemische Technische Forschungsgesellschaft m.b.H. Berlin. Ger. pat. 560,173 (Nov. 5, 1930).—In order to prevent food stuffs from absorbing the odors and taste of the wrapping of paper or parchment, the stock is treated with diacetyl or its compounds. For example, 100 ccm of stock of the usual beater consistency is mixed with 0.4 mg of diacetyl or with 5 mg of diacetyldioxim and then processed in the usual manner.—J. F. O.

Process in the Manufacture of Board. P. Burchardt, Nasviken. Swed. pat. 74, 705 (June 12, 1931). Addition to Swed. pat. 72,131.—A change being made in the main patent, so that the materials used as protection against moisture (asphalt and tar) is wholly or partially replaced by silicate.—J. F. O.

Process for the Manufacture of Roofing Paper with a Metallic Base. K. Ohlsson, Stockholm. Swed. pat. 74,719 (Nov. 5, 1929).—J. F. O.

Process for Making Fiberous Materials, Like Board, Impervious to Liquids. E. T. Rydberg, Liljeholmen, Sweden. Nor. pat. 50,905 (Dec. 20, 1930).—The materials are first impregnated with a mixture of a special oil and sulphur chloride in such relative quantities that no complete vulcanization takes place and that the action of sulphur chloride then assists in the completion of vulcanization in the material impregnated.—J. F. O.

The Use of Grape Sugar in the Paper Industry. Hans Wrede.,Papier-Fabr. 30, No. 29: 463-64 (July 17, 1932). —A resume of the properties imparted to paper in which grape sugar is present. It is especially valuable in paper used for cement sacks in that it keeps the paper pliable instead of brittle and hard when it comes in contact with the hot cement. When grape sugar is added to the beaters it increases the fold of the paper.—J. F. O.

Grape Sugar in the Paper Industry and the Methods for its Use. Hans Wrede. Wochbl. Papierfabr. 63, No.

24: 465 (June 11, 1932).—Only in the last years has grape sugar been used to any great extent in the paper industry, formerly it was used to soften genuine parchment. The grape sugar used is similar in its properties to glycerine. The technical grape sugar is not a single chemical compound but a mixture of several chemical compounds, in which the grape sugar is scientifically known as d-glucose. In the manufacture of grape sugar, the optimum composition of the various compounds is used. This grape sugar makes the cellulose fibers soft and pliable, increases the fold and aids in hydration. Other chemical and physical properties are given.—J. F. O.

The Use of Grape Sugar as an Addition to Pulp and Half Stock Which Can Be Dried and Then Again Easily Broken Up. Hans Wrede. Papier-Fabr. 30, No. 34:522 (Aug. 21, 1932).—Description of German patent 537,335 of October 31, 1930, which claims that pulp or half stock so impregnated with grape sugar can be easily broken up in the beaters. Mention of the important properties of grape sugar.—J. F. O.

The Use of Grape Sugar for Pergamin Paper and Parchment Substitute. Hans Wrede. Wochbl. Papierfabr. 63, No. 34: 642-44 (August 20, 1932).—The brittle pergamin paper can be made pliable by moistening the paper with a 5 to 10 per cent solution of grape sugar. If 5 per cent calcium chloride is added the grape sugar is tax free. Furnishes and methods for the use of grape sugar are given.—J. F. O.

Concerning the Possible Uses of Latex in the Paper and Board Industry. E. A. Hauser and M. Hunemorder. Papier-Fabr. 30, No. 23A: 82-85 (June 4, 1932). A general discussion of the various methods for adding latex to paper and board and the properties of the finished product.—J. F. O.

Process for the Manufacture of Filter Paper or Similar Papers. Paul Siede, Bad Kreuznach. Ger. pat. 549,831 (Oct. 9, 1929).—In order to manufacture filter paper from cellulose fibers, or mixture of cellulose fibers with other fiberous materials, such as asbestos; the fibers are mixed with a strongly diluted solution of gelatin, which contains about 30 grams of gelatin in 100 liters of water.—J. F. O.

Milk Bottles of Paper. Wochbl. Papierfabr. 63, No. 41: 765 (Oct. 8, 1932).—A short description of its manufacture.—J. F. O.

Process for the Manufacture of Hardened Corrugated Board. Wilhelm Beckmann, Duisberg. Ger. pat. 554,746 (Sept. 9, 1930).—The web of paper is made from stock in which lime is added at the beaters, the sheet is then immersed in a solution of water glass, and before it is completely dried it is passed between heated corrugating rolls, after which additional heated corrugating rolls are used until the paper is dried and hardened.—J. F. O.

Machine for the Manufacture of Corrugated Paper. Aktiengesellschaft für Cartonnagenindustrie, Dresden. Ger. pat. 556,985 (June 6, 1931).—J. F. O.

Process for the Manufacture of Corrugated Paper with Longitudinal Corrugations. Jacob Moll, Lucka. Ger. pat. 556,986 (Feb. 19, 1931).—The paper to be corrugated is passed over corrugated forms in which pressure is exerted on the paper to form the corrugations.—J. F. O.

Process for the Manufacture of Solid Insulating Materials, Especially Insulating Paper, Insulating Silk and Insulating Cotton. Naamlooze Vennootschap De Bataafsche Petroleum Maatschappij, Hague, Holland. Ger. pat. 558,222 (March 3, 1931).—The starting product is drenched in a light liquid of good capillary properties, free from water, with a low boiling point and soluble in a mineral oil, so that a viscous mass with insulating properties is obtained. The solvent is driven off by heating, suitably under reduced pressure.—J. F. O.

Process for Making Electro Chemically Written Papers, Linen or Similar Materials Usable. Siemens & Halske Akt. Ges. Berlin. Ger. pat. 558,027 (March 4, 1930).—The materials are treated with certain chemicals. —J. F. O.

Process for the Manufacture of Paper Making Felts, Resistant to Heat, Acid and Rotting. Firma Christfried Petzold, Vogtland. Aust. pat. 126,386 (Aug. 15, 1931).—A thin coating of a silicate, for example, a magnesium silicate is precipitated upon the raw fiber, yarn or the finished felt.

New TAPPI Members

The executive committee of the Technical Association of the Pulp and Paper Industry have announced the following elections to membership:

Alfred Bryant, Kalamazoo, Mich., was for seven years an apprentice with Spicer Brothers, Alton, England, following which he was for 25 years with the Bryant Paper Company, Kalamazoo, Mich., where he held positions from screen boy to superintendent. During the past few years he has been superintendent of the Watervliet Paper Company, Watervliet, Michigan, and the Newton Falls Paper Company, Newton Falls, N. Y.

Dale S. Chamberlin, technical engineer, paper division, National Oil Products Company, Harrison, N. J., is a graduate of the University of Michigan, Lehigh University, and the Imperial College (London). He was formerly a professor at Lehigh University and technical director of R. K. Laros Silk Company, Bethlehem, Pa.

James D. Corfield, sales engineer, Michigan Steel Casting Company, Detroit, Mich., attended Pennsylvania Military College.

Guthrie S. Mabrey, assistant chemist, Southern Kraft Corporation, Mobile, Ala., is a graduate of the University of Alabama and Case School of Applied Science.

Kermit E. Olson, assistant chemist, Tomahawk Kraft Paper Company, Tomahawk, Wis., attended Oshkosh State Teachers' College, Oshkosh, Wis.

Sidney L. Schwartz, junior engineer, Forest Products Laboratory, Madison, Wis., is a 1930 graduate of Armour Institute of Technology.

TAPPI Notes

The Pacific Section of the Technical Association of the Pulp and Paper Industry will meet at the Winthrop Hotel, Tacoma, Washington, October 20 and 21, 1933. An excellent program is being prepared and a trip is being planned for a visit to Mount Tacoma National Park.

E. S. Hinman, formerly pulp mill superintendent, P. H. Glatfelter Company, Spring Grove, Pa., is now technical director of the Penn Fibreboard Company of York, Pennsylvania.

M. R. Wilkins, formerly chemist of the Marinette & Menominee Paper Company, is now with the Bryant Paper Company, Kalamazoo, Mich.

J. Whitney Perry, who was recently an American Exchange Student at Darmstadt, Germany, is now in the research department of the National Aniline and Chemical Company, Buffalo, N .Y.

R. T. Petrie, formerly erecting engineer for the Minton Vacuum Dryer Corporation, is now Pacific Coast representative of the Bagley & Sewall Company, of Watertown, N. Y., and is located at 3216 N. E. 42nd Avenue, Portland, Ore.

A Contribution to the Knowledge of Rosin Sizing*

By Harold W. Bialkowsky[1]

Abstract

Measurements were made on the degree of hydrolysis of dilute sodium resinate solutions at concentrations that would be prevalent in the beater. The degree of hydrolysis was determined by the method employed by McBain for generally measuring the hydroxyl-ion concentration of soap solutions. This method is based on the rate of the catalytic decomposition of nitrosotriacetonamine by hydroxyl-ions. The degree of hydrolysis of an N/100 sodium abietate solution was found to be 0.54 per cent at 30 deg. C. At 56 deg. C. the extent of hydrolysis in an N/300 sodium abietate solution was found to be 4.3 per cent. These results are in close agreement with the data reported by Beedle and Bolam (1). At 90 deg. C. these authors found the extent of the hydrolysis of .024 N and .012 N sodium abietate solutions to be 4.0 and 5.7 per cent respectively. The determination of the degree of hydrolysis of soap solutions by the method based on the catalytic decomposition of nitrosotriacetonamine, was shown by McBain to be in excellent agreement with the hydrolysis determination based on the method involving electromotive force measurements. The above data on the hydrolysis of neutral sodium resinate solutions are contrary to the results of Ivanoff (2). Ivanoff found that at a dilution of 0.5 gram of rosin per liter (0.0015 N sodium resinate) as much as 95 per cent of the rosin is free. An 0.0015 sodium resinate solution shows a slight turbidity, the turbidity can hardly be due to 95 per cent of the rosin present, since on the addition of a mineral acid a very much greater turbidity is produced. Measurements were also made on the electrical conductivity of sodium resinate solutions. The increase in the equivalent conductance between the concentrations of N/100 and N/1000 is not very great, showing that no great changes are taking place in the constitution of the electrolyte in this concentration range. The equivalent conductance of the sodium resinate solutions are high, but there does not appear to be any pronounced tendency of the conductance curve toward approaching the conductance curve of sodium hydroxide, which would be a rough indication of hydrolytic effects. At the concentrations prevailing in the beater, the extent of the hydrolysis of sodium resinate or neutral size is only several per cent, and a major portion of the neutral size can exist in solution as sodium resinate. The stability of the rosin soap in the beater is determined mainly by the alkalinity of the beater water.

It was found that commercial pulp fibers have a great tendency to lower the alkalinity of dilute sodium hydroxide solutions. In the concentration range between N/1000 and N/100, the alkali removal curves by the pulp fibers resemble typical adsorption curves, but the mechanism of the alkali removal can not be due to true adsorption processes, since higher temperatures favor a great alkali removal. The time necessary for equilibrium conditions to be established between the solutions and the pulp fibers is rather long. A great reduction in alkalinity of the solutions occurs in the initial hours of contact with the pulp fibers; the reduction in alkalinity becomes nearly constant in the more concentrated solutions after seventy hours, but a slight increase in alkali removal is still noticeable after this period of time, especially in the more dilute solutions (see Fig. 5). The lowering of the alkalinity is very appreciable for most commercial pulps in an N/500 sodium hydroxide solution, several pulps remove 80-90 per cent of the available alkalinity. The activity of a pulp to remove alkali appears to be determined by the nature of the pulp; the behavior of different pulp fibers is quite variable. Unbleached pulps exhibit a great activity toward alkali removal, bleached chemical pulps have an intermediate effect, and purified wood fiber and rag-stock show the lowest activities (Fig. 9).

The lowering of the alkalinity of dilute sodium hydroxide solutions by pulp fibers was determined by titration methods. Additional measurements were made on the reduction in the electrical conductivity of sodium hydroxide solutions due to presence of pulp fibers. Measurements were also made on the reduction of the hydroxyl-ion concentration of sodium hydroxide solutions due to the presence of pulp fibers, by a method based on the rate of the catalytic decomposition of nitrosotriacetonamine by hydroxyl-ions. All of these measurements indicate the great activity of pulp fibers toward reducing the alkalinity of dilute sodium hydroxide solutions, and the great differences in behavior of the various pulps.

The activity of pulp fibers toward lowering the alkalinity of dilute alkali solutions should have an effect on the normal hydrolysis of neutral size solutions. The stability of sodium resinate solutions is determined by the natural alkalinity of these solutions. If this alkalinity is removed, hydrolysis will take place to restore the equilibrium, with the liberation of free abietic acid. Since different pulps have a varied action in this respect the amount of abietic acid liberated, will vary with the kind of pulp. The behavior of commercial pulps toward dilute sodium resinate solutions was studied, and the results indicate that the various pulps have a variable action on these solutions. The amount of rosin liberated from the solutions and retained by the pulp fibers is dependent on the nature of the pulp. Pulp fibers which retain a relatively large amount of rosin, also show a great tendency toward lowering the alkalinity of sodium hydroxide solutions. For a series of different pulps, the activity toward alkali removal is not exactly proportional to the effect of these pulps on the soap solutions, but nevertheless, the action of the pulp fibers on the rosin solutions appears to be closely related to the activity of the pulp fibers toward alkali removal (Figs. 9 and 10). These experiments seem to indicate that the presence of the pulp fibers forces the hydrolysis of the sodium resinate. Since no other agent was used in these experiments to precipitate the rosin, the amount of rosin retained by the fibers was determined primarily by the following factors: First, the amount of free rosin liberated from the soap solution by the action of the pulp fibers on the alkalinity of the solution and second, the ability of the pulp fibers to retain this liberated rosin. There is the possibility of

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the pulp fibers removing the rosin from the solution as sodium resinate, and probably a portion of the rosin found in the fibers was present as the sodium salt, but due to the effect of the pulp fibers on the alkalinity of the soap solutions, it is quite likely that the rosin found in the fibers is primarily the liberated, colloidal abietic acid.

In commercial practice, experience has shown, that in general, the higher the cellulosic purity of the stock, the more difficult it is to produce efficient sizing with rosin. It has been found that rag stock and alpha fiber are more difficult to size than bleached sulphite, the bleached sulphite pulp in turn, presents greater sizing difficulties than an unbleached fiber. This behavior of the various commercial pulps resembles the activity of these pulps toward dilute sodium hydroxide and resinate solutions. The nature of the pulp fibers appears to be a rather important factor in the problem of rosin sizing.

In the process of sizing paper with rosin, the rosin size, either as a neutral soap or as a free rosin size, is added to the slush fiber stock with the subsequent addition of alum. In some cases the alum is added to the pulp mixture before the addition of the rosin size. Such a system consisting of size, aluminum sulphate, cellulose fibers and water is an extremely complicated one, both physically and chemically. The colloidal properties and characteristics of cellulose alone present difficulties, but in the presence of colloidal electrolytes, such as alum and rosin size in dilute solution, the conditions become very complex. The concentrations of the rosin size and the alum in the beater are quite low, and the natural behavior of these constituents will probably be affected by the colloidally active cellulose fibers. Under beater conditions, therefore, the action of the alum on the rosin size is probably not a simple chemical precipitation. Due to the hydrolytic effect of water and also the presence of the colloidally active cellulose fibers, the rosin size, initially added to the pulp mixture as a sodium soap, may possibly suffer a partial or complete chemical rearrangement with the formation of chemical aggregates other than the pure sodium soap. In order to understand the action of the alum on the rosin size in the pulp mixture, it is necessary to know the chemical and physical nature of the rosin size under these conditions just before the alum is added. The present investigation was limited to a study of the nature of dilute sodium abietate solutions, and the action of various commercial pulp fibers on these solutions. The behavior of these pulp fibers toward dilute sodium hydroxide solutions was also investigated for the purpose of gaining a better understanding of the action of the pulp fibers on the rosin soap solutions.

Historical Survey

In 1807, Moritz Illig, of Frankfort, Germany, devised a process for sizing paper with rosin soap while the stock was being prepared. Previous to that time, the comparatively small quantities of paper then produced were rendered water and ink resistant by surface sizing with starch and glue. Illig's process consisted of adding rosin soap to the stock in the hollander, with the subsequent addition of alum to coagulate the rosin. Illig's process is used throughout the paper industry today, with only very minor changes. The mechanism of the sizing process has been the subject of much discussion and experimental work. The literature on the subject is quite voluminous, and there are many differences of opinion. Only a brief review will be considered here, a more complete review can be found in the papers by Olsen and Gortner (*3*) and by Klein (*4*).

Illig's opinion of the mechanism of the process, was that the rosin was first rendered water soluble by saponification with alkali, and simply precipitated as free rosin in the stock mixture by the alum (*5*). Later, Orioli explained the mechanism of the sizing process on the assumption that the precipitated aluminum resinate is the main agent responsible for the sizing action, and that the coagulated free rosin simply supports this action. In 1878, Wurster, probably unaware of the opinions of Illig, again propounded the theory, that free rosin is the main sizing agent (*6*).

Cross and Bevan developed the theory that aluminum resinate is decomposed by the pulp fibers into free rosin and alumina, which are then adsorbed by the cellulose fibers and produce the sizing action.

Griffin has shown that neither free rosin or aluminum resinate alone can produce efficient sizing, and that both are necessary (*7*).

During the past thirty years, many investigators have presented experimental data and opinions concerning the mechanism of the rosin sizing process, but with many conflicting results. Several authors maintain that free rosin is the main sizing agent, while others believe to have evidence in favor of aluminum resinate as the principal agent. Arledter, (*8*); Remington, Bowach and Davidson, (*9*); Neugebauer, (*10*); Sieber, (*11*); Stoeckigt and Klinger, (*12*); Heuser, (*13*); Beltzer, (*14*); and many others.

Zherebov, (*15*), disagrees with the colloidal theory of Sieber, Lorenz, Stoeckigt and Klinger. According to Zherebov, the active sizing acids of colophony are crystalloidal, although the sizing solution is colloidal. If the union of aluminum hydroxide and rosin is merely an adsorption of one colloid on another, then the amount of aluminum hydroxide in the combination should vary. But he states that the results of Remington, et al. Heuser, and Sieber show nearly the same amount of aluminum oxide, namely, 4.78 to 5.69 per cent. Making allowance for variation in the acid number of the different rosins, Zherebov concludes that alum and rosin enter into chemical reaction. Also according to Zherebov, only those compounds have a sizing action, which are chemically active, that is, those that are unsaturated and have double bonds.

Klemm (*16*), has pointed out the great importance of physical conditions, such as the manner of beating, the influence of drying, etc. The preparation of the stock, the thermal conditions in the beater, jordan and chest, as well as the handling of the stock on the machine and through the driers have been found to be of fundamental significance in obtaining the desirable sizing results.

Ostwald and Lorenz (*17*), come to the conclusion that aluminum sulphate and sodium resinate are hydrolyzed in the beater. Cellulose fibers are electronegative, alum-treated fibers are positive, and colloidal rosin is negatively charged. The positively charged alumina is adsorbed by the fibrous interfaces of the negatively charged cellulose fibers. Alumina also forms a positive layer around the electronegative rosin particles, so that the colloidal alumina acts as an electrastatic binding material between the fibers and the rosin. Lorenz also found that aqueous solutions of sodium resinate are on the boundary line between molecular dispersoids and typical colloids and that free rosin is a typical colloidal suspension with a negative charge.

Thiriet and Delcroix (*18*), the discoverers of the Delthirna process for the preparation of rosin size, were probably the first investigators to determine the effect of the hydrogen-ion concentration on rosin sizing. They obtained the best sizing at pH of 4.5 to 5.0. They consider that at pH of 4.5-5.0, the cellulose and the rosin have opposite electrical charges, and that the sizing is produced

by a union between the positively charged rosin particles and the electronegative cellulose fibers. Above and below this range of hydrogen-ion concentration, the rosin and the cellulose have the electrical charges of the same sign, and the sizing remains incomplete.

Shaw (*19*), was able to show by practical experiments, that at pH of 5.0-5.5, the conditions are the most suitable for the attainment of complete sizing, with a possible saving of 33 per cent on alum.

According to Roschier (*20*), at a pH of 3.7-3.9, only a small amount of aluminum resinate is formed, which is held directly by the fibers, and under these conditions, alumina is also chemically bound by the fibers, which together with the resinate give fibers a positive charge, so that the negatively charged free rosin can unite with the fibers. A large portion of the alum is lost under these conditions. At pH of 4.5-5.0, sodium resinate is transformed mainly into the aluminum salt, which is directly bound to the fibers. Excess alum forms the electropositive, colloidal hydrate of alumina, which combines with the colloidal free rosin to form electropositive adsorption compounds. These adsorption compounds can then be taken up by the negatively charged cellulose fibers.

The effect of heating the moist paper sheet on the final sizing, has been investigated by Oeman (*21*). Oeman found that strong heating of the moist paper sheet is detrimental to the sizing, and that the injurious effects are at a minimum at a hydrogen-ion concentration of pH of 4.0-5.0.

Olsen and Gortner (*3*), found that the adsorption of rosin by fibers is a function of the time, so that the process must be a colloidal phenomenon rather than a purely chemical reaction. The adsorption of rosin depends on the ash content of the fibers, and that the most suitable hydrogen-ion concentration for efficient sizing depends on the ash content of the fibers. For various pulps, the most favorable pH value falls between 4.5 and 6.5.

Kanamaru (*22*), has made a detailed study of the effect of the zeta potential of cellulose fibers on the sizing process. His results indicate that the sizing efficacy depends upon the quality and nature of the pulp, and that a decidedly negative pulp has, in general, a better sizing efficacy.

The degree of dissociation of rosin size has been investigated by Haug (*23*). According to Haug, sodium resinate, when highly diluted with distilled water, undergoes hydrolysis which is approximately 100 per cent. These results are based on measurements of the electrical conductivity of sodium resinate solution, and on purely chemical tests.

According to Ivanoff (*2*), at a dilution of 0.5 gram of rosin per liter, as much as 95 per cent of the rosin is free. Ivanoff concludes that at the dilution of the beater, practically all of the rosin is hydrolyzed and in the free condition.

Beedle and Bolam (*1*), following the work of McBain on the constitution and nature of soap solutions, have determined the extent of hydrolysis of several commercial soaps at 90 deg. C. For sodium abietate solutions, they find the extent of the hydrolysis of .024 and .012 normal solutions to be 4.0 and 5.7 per cent respectively.

The preceding remarks are but a brief summary of the literature of rosin sizing. There are a great many papers dealing with all phases of the subject, and a review of all of them can not be given here. There is a great deal of confusion and controversy in the work reported, but this is undoubtedly due to the difficulty of controlling the conditions of the experiments.

Statement of the Problem

The present study is concerned only with the nature of dilute sodium resinate solutions and the effect of various commercial pulps on these solutions. It is necessary to know the extent of the hydrolysis of sodium resinate solutions at beater concentrations, and the effect of pulp fibers on the hydrolysis of the soap, in order to understand the action of subsequent additions of alum. The literature on the hydrolysis of rosin sizing solutions at beater concentrations contains various conflicting reports. In some cases, complete hydrolysis is assumed, without any concrete experimental data, in other cases, the extent of the hydrolysis is reported with very little information concerning the methods of measurement. This study may be divided into the following three main parts:

1. The determination of the extent of the hydrolysis of sodium resinate solutions at beater concentrations.
2. The effect of various commercial pulp on dilute sodium hydroxide solutions.
3. The effect of various commercial pulps on dilute sodium abietate solutions.

The concentration of the size in the beater will vary with the furnish of the rosin, and the consistency of the stock in the beater. The consistency of the stock in the beater is generally 3 to 6 per cent. The furnish of the rosin size will vary from 0.5 to 5 per cent or higher, depending on the paper being produced. The following table shows the normality of the size in the beater, assuming the size to be neutral sodium resinate, at various consistencies of stock, and for various size furnishes based on the stock:

Percentage of Size.....		1	2	3	4	5
		Normality of Sodium Resinate				
Consistence of Stock.....	1%	.0003	.0006	.0009	.0012	.0015
	2	.0006	.0012	.0019	.0025	.0031
	3	.0009	.0019	.0028	.0037	.0046
	4	.0012	.0025	.0037	.0049	.0062
	5	.0015	.0031	.0046	.0062	.0077
	6	.0019	.0037	.0055	.0074	.0093

The concentration of the size in the beater, under most operating conditions, will fall in the range between N/2000 and N/100.

In these experiments it was advisable to work with a rather pure form of rosin, and throughout this entire study, the sizing solutions were prepared from pure abietic acid. The abietic acid was prepared according to the method reported by Steele (*24*). An outline of this method is given below.

The Hydrolysis of Sodium Resinate

The system consisting of size, aluminum sulphate, cellulose fibers, and water, is an extremely complicated one, both physically and chemically. The colloidal characteristics and properties of cellulose alone present difficulties, but in the presence of colloidal electrolytes, such as alum and rosin size in dilute solution, the conditions become very complex. The concentrations of the rosin size and the alum in the beater are quite low, and the natural behavior of these constituents will probably be affected by the presence of the colloidally active cellulose fibers. In more concentrated solutions in the absence of pulp fibers, sodium resinate and aluminum sulphate could react with one another with the formation of aluminum resinate. But in the concentrations prevailing in the beater, N/1000 to N/100, the chemical stability of both the alum and the soap are not very great, and the stability of these constituents could readily be affected by the presence of the pulp fibers. Sodium resinate is a salt of a strong base and a very weak acid and in very dilute solutions, hydrolysis takes place with the formation of colloidal rosin; due to the extremely low solubility of abietic acid in water, only a very small fraction of the abietic acid is in true molecular solution. Aluminum sulphate is a salt of a very strong acid and a weak base, and at lower concentrations, hydrolysis takes place with the formation of colloidal alumina. In these dilute solutions, the aluminum is partly

present as ionic aluminum and partly as a colloidal dispersion of alumina. When dilute sodium resinate solutions are allowed to react with dilute aluminum sulphate solutions, there are probably several products formed by the reaction. The rosin present as the sodium soap could be precipitated by the aluminum-ions or by the acidity of the resulting solution as aluminum resinate and free abietic acid respectively. The colloidal free rosin originally present, and that formed by the reduction in the original alkalinity by the acid of the alum, could form adsorption products with the colloidal alumina. It is quite difficult to distinguish between the true aluminum resinate that may be formed, and the rosin-alumina adsorption products. The aluminum resinate, it is true, should have a very definite chemical composition, as compared to the variable composition of the adsorption compounds. But under the conditions of these precipitations, the aluminum resinate precipitate could form adsorption compounds with any colloidal materials present, so that the resulting precipitate will have a more or less indefinite composition. If only colloidal adsorption compounds are formed, the average chemical composition of the precipitate cannot vary very much from the chemical composition of true aluminum resinate, since chemical equivalent quantities of the reactants are very nearly consumed in the precipitation regardless of the nature of the final product.

The characteristics and properties of soap solutions have been carefully studied by McBain and his collaborators (*25*). After considerable experimental work, requiring very painstaking measurements, McBain developed a comprehensive theory of soap solutions, which he defines as colloidal electrolytes. This theory is based on the hypothesis that all these solutions are salts in which one ion is replaced by an ionic micelle, which exhibits high conductivity and great solvation, and which carries a great number of electrical charges. The concentration of the solutions is a very important factor, in very dilute solutions the soap exhibits the properties of a simple electrolyte, while concentrated solutions and the addition of other substances may lead to the formation of a neutral colloid. The conception of an ionic micelle of great valency and hydration explains the really high conductivity and also the high mechanical viscosity. His work also establishes the important theoretical results that colloids and colloidal electrolytes may participate in true, perfectly reversible and reproducible equilibria.

According to McBain, in the case of very dilute solutions, the soaps are partially hydrolyzed according to the following equation

$$\text{Soap} + \text{Water} \rightleftarrows \text{Acid Soap} + \text{Free Alkali}$$

The acid is considered to be in suspension, either coarse or colloidal as the case may be, and to consist of something between the neutral salt NaR and the acid soap $NaHR_2$, where R is the radical of the fatty acid. Free fatty acid can only exist in excessively small amounts in such soap solutions, even in the presence of a large excess of free fatty acid. The above equation differs from the usually accepted course of hydrolysis which is generally expressed as follows:

$$\text{Soap} + \text{Water} \rightleftarrows \text{Free Acid} + \text{Free Alkali}$$

The free acid in this case either remains in a colloidal suspension or is precipitated. The data which establish the conception of an acid soap are based upon direct analysis, conductivity measurements, measurements of electromotive force, and measurements of the free hydroxyl-ion by the rate of catalysis of nitrosotriacetonamine.

In dilute solutions, decinormal or somewhat less, soaps are composed of simple electrolytes in true solution, with simple ions. In decinormal solution, hydrolysis is still present, but only in a very minor degree, since the hydroxyl-ion concentration was shown to be only about N/1000. With increasing concentration, the fatty acid ions rapidly coelesce to form the ionic micelles described above, until in N/2 or N/1 solution the colloidal electrolyte comprises all the soap, hydrolysis being still more insignificant. With further increase in concentration the ionic micelle becomes less solvated and conducts even better, the only crystalloidal constituent left is the metallic-ion, for the undissociated soap is now also in the colloidal form.

Prior to the work of McBain, much diversity of opinion existed as to the degree of hydrolysis of soap solutions, due mainly to the employment of unsuitable methods, such as direct titration, which disturbs the equilibrium and is bound to lead to erroneous results. The quantitative data of McBain show that all soap solutions are alkaline varying from N/30000 to N/300 for pure soap solutions, down to N/30000 for acid sodium palmitate, $NaHP_2$. Several per cent excess of alkali is required to drive back the hydrolysis completely, but not more than a few per cent of this alkali can be sorbed by the soap even in the presence of a large excess of alkali, which means that the hydrolysis must be equal to the alkalinity.

Soaps exhibit a rather high proper conductivity, and in concentrated solutions the conductivity is abnormally high (Bunbury and Martin) (*26*). In the case of the higher soaps, the electrical conductivity, after passing through a minimum at about N/10, rises with increase in concentration up to nearly normal solution. This further substantiates the hypothesis of an ionic micelle of conductivity intermediate between that of sodium and potassium ions, which was deduced from other considerations. The formation of the more highly conduction micelle from the comparatively slow, large true ion, and the change of the micelle-ion equilibria with change in concentration are mirrored in the conductivity curves.

In soap solutions which are clear and approximately homogeneous, a low temperature favors the formation of colloidal micelle, and this micelle is more hydrated than at higher temperatures. The adjustments in the equilibria of the solution due to changes in temperature are made very quickly, and are very soon complete to within one per cent, which makes it possible to readily obtain reproducible conditions.

In studying the hydrolysis of these soap solutions, McBain found the method of measuring hydroxyl-ion concentration by the catalytic decomposition of nitrosotriacetonamine quite useful in checking the results of other methods of measuring this hydrolysis. Due to the nature of these solutions, especially at higher concentrations, it was necessary to work at higher temperatures to obtain more or less homogeneous solutions over a wide range of concentration. For this reason most of the measurements on the hydrolysis of soap solutions were carried out at about 90 deg. C. Some experimental difficulties arise in making electromotive force measurements under these conditions, but McBain succeeded in obtaining good agreement between the electromotive force method of measuring the hydrolysis and the method depending on the rate of the catalytic decomposition of nitrosotriacetonamine. This method was developed by Francis and his collaborators (*27*), and has also been studied and used by a number of other investigators.

The hydrolysis of soap solutions, measured by the rate of catalysis of nitrosotriacetonamine was investigated by McBain and Bolam (*28*). The method of measurement was based on that of Francis, involving the measurement of the volume of the nitrogen gas liberated. The authors found these results in good agreement with the hydrolysis values obtained by electromotive force determinations.

Beedle and Bolam (*1*), determined the hydrolytic alkalinity of pure and commercial soaps, using the same method. The following table reported by these authors shows the extent of hydrolysis of several commercial soaps at 90 deg. C.:

Soap	Concentration of Soap			Concentration of Hydroxyl-ion	Per Cent Hydrolysis
Sodium Oleate	.1 N	2.7	per cent	.00079 N	.81
Sodium Oleate	.05 N	1.4	per cent	.00098 N	1.99
Sodium Oleate	.02 N	.6	per cent	.00074 N	3.7
Sodium Oleate	.01 N	.3	per cent	.00066 N	6.6
Sodium Oleate	.002 N	.06	per cent	.00055 N	28.1
Sodium Oleatate ..	.004 N	1.0	per cent	.00098 N	4.0
Sodium Abietate ..	.012 N	.5	per cent	.00069 N	5.7

The above table shows that for an N/100 sodium resinate solution, the degree of hydrolysis is about 6 per cent at 90 deg. C. The degree of hydrolysis would be much lower than this value at room temperature. In a beater with the stock at a consistence of 6 per cent, and a size furnish of 6 per cent, the concentration of the size in the beater water would amount to approximately N/100, assuming the size to be neutral sodium resinate. If we neglect for the present, the effect of impurities in the water, and the influence of the presence of the stock on this dilute soap solution, we could expect in a beater of stock under these conditions, that the size is still present as sodium resinate at least to the extent of ninety-five per cent.

The degree of dissociation of rosin size has been investigated by Haug (*23*). According to Haug, sodium resinate, when highly diluted with distilled water, undergoes hydrolysis which is approximately 100 per cent. These results are based on electrical conductivity measurements of sodium resinate solutions and on purely chemical tests.

According to the cryoscopic measurements of Ivanoff on sodium resinate solutions (*2*), at a dilution of 0.5 gram of rosin per liter, as much as 95 per cent of the rosin is free. Ivanoff concludes that at the dilution of the beater, practically all of the rosin is hydrolyzed and in the free condition.

In view of the contradictory results on the degree of hydrolysis of sodium resinate reported by Beedle and Bolam on the one hand, and by Haug and Ivanoff on the other, the author investigated the extent of the hydrolysis of these dilute solutions. The hydrolysis values were determined by measuring the hydroxyl-ion concentration by a method based on the catalytic decomposition of nitrosotriacetonamine. Measurements were also made on the electrical conductivity of sodium resinate solutions for the purpose of noting any changes in the nature of the soap solutions with dilution. These measurements are described in detail in the experimental part given later.

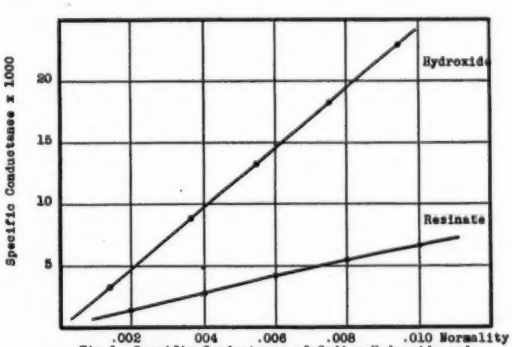


Fig.1. Specific Conductance of Sodium Hydroxide and Resinate Solutions

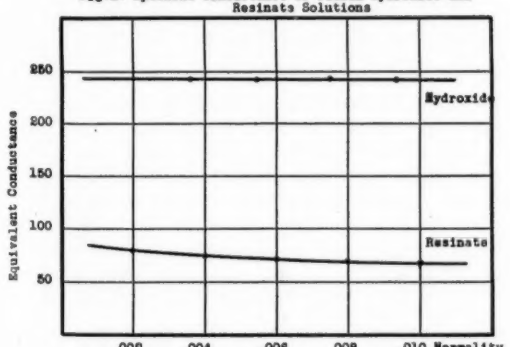


Fig.2. Equivalent Conductance of Sodium Hydroxide and Resinate Solutions

Employing a method based on the catalytic decomposition of nitrosotriacetonamine by hydroxyl-ions, the author found the extent of the hydrolysis of an N/100 sodium abietate solution at 30 deg. C. to be 0.50 per cent. For an N/300 sodium abietate solution at 56 deg. C., the extent of the hydrolysis was found to be 4.3 per cent. These values appear to be in good agreement with the values obtained by Beedle and Bolam. For 0.024 N and 0.012 N sodium abietate solutions at 90 deg. C. these investigators found the extent of the hydrolysis to be 4.0 and 5.7 per cent respectively. At lower temperature, the hydrolysis of these solutions will undoubtedly be somewhat lower. Hydrolysis measurements involving the direct determination of the hydroxyl-ion concentrations seem to indicate that at beater concentration under normal temperature conditions, the neutral rosin soap is not appreciably affected by the hydrolytic effect of water.

Any great changes in the nature of soap solutions upon dilution, due to the hydrolytic effect of water, should be reflected in the electrical conductivity curves of the solution. The conductivity values of soap solutions are relatively high when compared with other salts of large molecular size but they are much lower than the values for sodium hydroxide solutions of the same molar concentration. If we assume that the hydrolysis of the soap results in the formation of free colloidal abietic acid and free sodium hydroxide, as given in the following equation:

$$NaR + HOH \leftrightarrows HR + NaOH$$

then at infinite dilution hydrolysis should be complete, and the equivalent conductance of the soap solution should approach the equivalent conductance of sodium hydroxide, since on complete hydrolysis one equivalent quantity of free alkali.

The following tables show the results obtained for the specific and equivalent conductance of sodium resinate solutions at 25 deg. C. The corresponding values for sodium hydroxide solutions at the same temperature are also given for comparison.

SODIUM ABIETATE SOLUTIONS

Concentration	Specific Conductance	Equivalent Conductance
.002 N	.000153	76.5
.004	.000296	74.2
.006	.000437	73.2
.008	.000565	70.6
.010	.000685	68.5
.0557	.00282	50.7
.1113	.00508	45.7

SODIUM HYDROXIDE SOLUTIONS

Concentration	Specific Conductance	Equivalent Conductance
.00135	.000330	245
.00364	.000895	245
.00548	.00135	245
.00756	.00184	244
.00944	.00228	242

These values are shown graphically in Figs. 1 and 2. In Fig. 1 the specific conductances are plotted against the concentration, and Fig. 2 shows the trend of the equivalent conductance with concentration. The specific conductance is very nearly directly proportional to the concentration for both the hydroxide and the resinate throughout the concentration range under consideration. The equivalent conductance curve of the hydroxide is practically a straight line and very nearly horizontal. The equivalent conduct-

ance of the resinate rises gradually with increase in dilution. This increase may be due to the greater activity of the ions with dilution, and also the hydrolytic breakdown of the resinate into free hydroxide and colloidal abietic acid. The slope of this curve becomes greater with increase in dilution, but even at the concentration of N/500, the slope is not very great and the equivalent conductance of the soap is still far below that of the hydroxide. The results seem to indicate that the hydrolytic effects are becoming greater with increase in dilution, but throughout the concentration range under consideration, the hydrolysis of the soap is not very great, and that a large percentage of the rosin is still present as the sodium salt.

The conductivity measurements, therefore, are in good agreement with the results obtained on the hydrolysis of rosin soap by the method involving the determination of the hydroxyl-ion concentration. At beater concentrations, the pure neutral rosin soap is hydrolyzed only to a very slight extent, and the major portion of the rosin is still present as the sodium salt. These results are in good agreement with the work of Beedle and Bolam, the contrary to the work reported by Haug and by Ivanoff.

The previous discussion was limited to the behavior of pure dilute sodium resinate solutions. The hydrolysis equilibrium is partially determined by the concentration of the small amount of free alkali formed by the hydrolysis. Any condition which will affect the concentration of this free alkali will also affect the hydrolysis equilibrium of the soap. A decrease in the free alkali concentration will favor a further hydrolysis of the soap to reestablish the equilibrium conditions. Under beater conditions we are dealing with a relatively large cellulose-water interface, and the fiber surfaces are capable of removing ions from the solution by colloidal forces. In the following pages, the action of various types of commercial pulp fibers on dilute sodium hydroxide solutions will be discussed. A knowledge of the effect of the pulp fibers on solutions of low alkali concentrations should be of value in determining the effect of the pulp fibers on the hydrolysis equilibrium of the rosin soap.

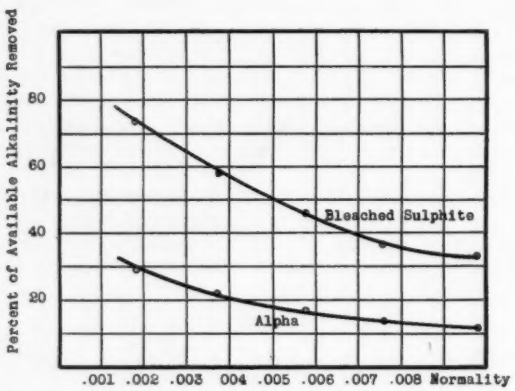


Fig.3. Removal of Alkali by Pulp vs Concentration

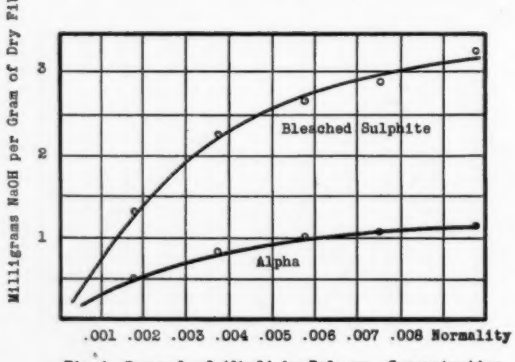


Fig.4. Removal of Alkali by Pulp vs. Concentration

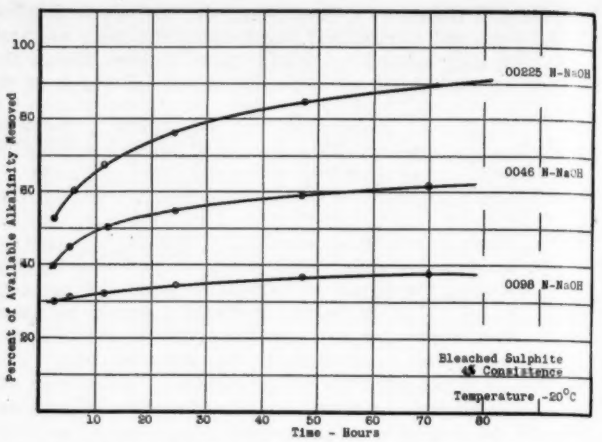


Fig.5. Removal of Alkali by Pulp from Dilute NaOH Solutions with Time

Alkali Removal by Pulp

The action of alkalis on cellulose has been a subject of great importance in the field of cellulose chemistry. The majority of the work reported in the literature, however, is concerned with the behavior of cellulose toward strong caustic solutions. It is known that even in very dilute alkali solutions the presence of cellulosic material has a tendency to lower the alkalinity of the solutions.

Figure 3 shows the effect of pulp fibers on the alkalinity of sodium hydroxide solutions over the concentration range from N/500 to N/100 sodium hydroxide. The loss in alkalinity will vary with the initial concentration of alkali, the consistence and nature of the pulp, the time of contact of the fibers with the solution and the temperature. The experimental methods employed in obtaining these curves are given in detail in the experimental part of this paper. In Fig. 3, the per cent of the available alkalinity removed by the fibers is plotted against the initial alkali concentrations, for two different types of pulp. The bleached sulphite fibers lower the alkalinity of the solutions to a much greater extenf than the alpha fibers. At the lower concentrations, the former removes almost 80 per cent of the available alkalinity, whereas the latter removes about 30 per cent. In Fig. 4, the milligrams of sodium hydroxide removed from solution per gram of dry fiber are plotted against the original alkali concentrations. These curves resemble typical adsorption isotherms, but further evidence seems to indicate that the loss in alkalinity is not strictly an adsorption process.

The effect of the time of contact of the cellulose fibers with the solution on the loss in alkalinity is shown in Fig. 5. The per cent of the available alkalinity removed is plotted against the time of contact of the fibers with the solution, at three different initial alkali concentrations. The loss in alkalinity increases with the time of contact, and even after eighty hours of contact, absolute equilibrium conditions are not attained. Equilibrium conditions are more nearly attained for the more concentrated solutions than for the very dilute solutions.

If the removal of the alkalinity were due to pure adsorptive processes, then lower temperatures would favor

greater adsorption. The effect of temperature on the loss in alkalinity is shown in Fig. 6. In this figure the per cent of available alkalinity removed is plotted against the time of contact of the fibers with the solution, at two different temperatures, all other conditions remaining constant. A larger percentage of the available alkalinity is removed at 40 deg. C. than at 20 deg. C. These results indicate that the alkali removal is not strictly a process of adsorption, but probably a combination of adsorption, absorption and neutralization. In this connection, however, our main concern is the fact that the alkalinity is reduced regardless of the actual mechanism of the removal.

Fig. 7 shows the effect of change in pulp consistence on the loss in alkalinity of the solution. The solid curve gives the per cent loss in alkalinity plotted against the pulp consistence and the broken curve shows the milligrams of sodium hydroxide removed per gram of pulp plotted against consistence.

The previous discussion shows the effect of several factors on the removal of alkalinity by pulp fibers. In Figs. 3 and 4, the difference in activity of two distinct types of pulp fibers toward alkali removal is illustrated. The loss in alkalinity appears to be determined, to a very great extent, by the nature of the pulp fibers. The differences between various types of commercial pulp fibers with regard to their activity toward lowering the alkalinity of sodium hydroxide solutions were investigated. Figures 8 and 9 show the effect of several pulps on dilute sodium hydroxide solutions. In Fig. 8, the per cent available alkalinity removed is plotted against the original alkali concentrations, and in Fig. 9, the milligrams of sodium hydroxide per gram of pulp is plotted against the original alkali concentrations. In every case, the per cent of the available alkalinity removed increases with increases in dilution. These data also seem to indicate that the per cent alkalinity removal approaches 100 per cent at infinite dilution. The kraft and sulphite pulps remove over 80 per cent of the available alkalinity at the initial concentration of N/500. The particular sample of unbleached sulphite used in this case was from a rather raw cook. This pulp shows a pronounced tendency to lower the alkalinity over

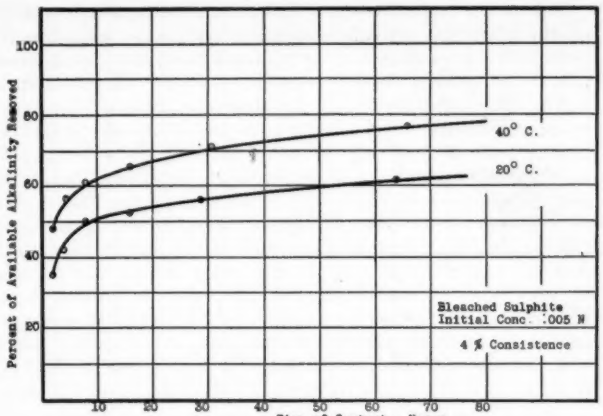


Fig. 6. Alkali Removal by Pulp with Time at 20° and 40° C.

the entire concentration range. The sulphite pulp, bleached Mitscherlich sulphite, and the ordinary bleached sulphite samples follow the unbleached sulphite in the decreasing order of their activity toward dilute alkali solutions. The alpha fiber exhibits a much lower activity than the other wood fibers and finally the rag-hardstock (muslins) shows only a slight tendency toward alkali removal. These results indicate the great difference in the activity of various commercial pulp fibers on dilute alkaline solutions. It is interesting to compare the order of the activities of the various pulps. In general, the purer the pulp the more difficult it is to obtain good sizing in the resulting sheet. Ragstock is more difficult to size than the ordinary wood pulps. It is also interesting to compare the action of this series of pulps on sodium hydroxide solutions with the results obtained on the action of the same on dilute sodium abietate solutions. As will be shown later, the action of the various pulps toward sodium hydroxide solutions is quite analogous to the behavior of these pulps toward the sodium abietate solutions.

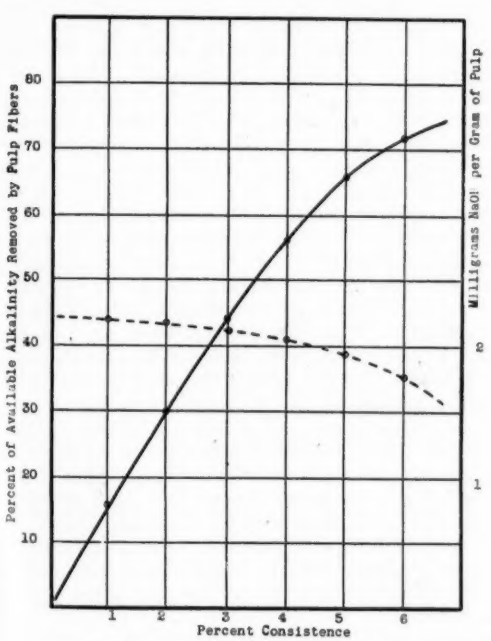


Fig 7. Removal of Alkali with Change in Pulp Consistence

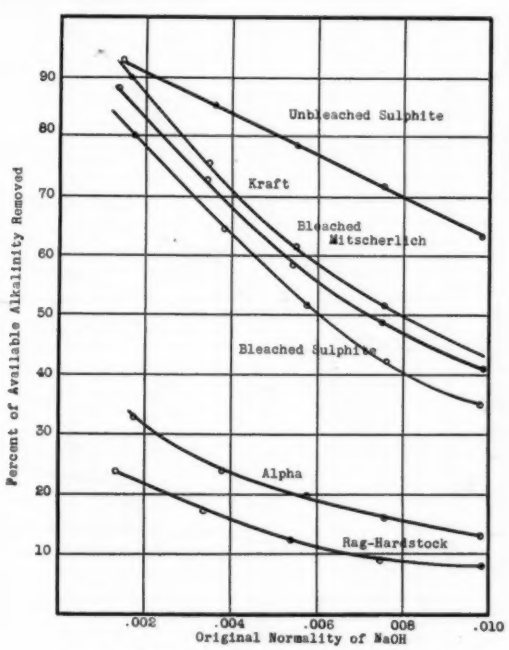


Fig.8. Alkali Removal from Dilute Sodium Hydroxide Solutions by Commercial Pulps

All of the measurements just described on the lowering of the alkalinity of dilute sodium hydroxide solutions by pulp fibers were obtained by methods involving direct titration. To obtain further evidence, a few measurements were also made involving the determination of the electrical conductivity of dilute sodium hydroxide solutions before and after being in contact with pulp fibers. It was found that the conductivity of the alkali solutions decreased on being in contact with the pulp fibers, but in the case of the very dilute solutions, it was quite difficult to obtain an accurate measure of the loss in alkalinity, due to materials present in the pulp which are soluble in the solutions and have an effect on the conductivity. However, this disturbing factor could be roughly accounted for, by measuring the conductivity of distilled water after being in contact with the pulp fibers, and deducting this conductivity value from the conductivities of the pulp-treated alkali solutions. In this manner, the loss in conductivity of sodium hydroxide solutions due to contact with pulp fibers was determined, and the percentage losses in conductivity were found to be of approximately the same order of magnitude as the loss in alkalinity by methods involving direct titration. The results of these measurements are more fully described in the experimental part of this paper.

A few measurements were also made on the loss in hydroxyl-ion concentration of dilute sodium hydroxide solutions on contact with pulp fibers. The hydroxyl-ion concentrations were determined by a method based on the catalytic decomposition of nitrosotriacetonamine. The loss in hydroxyl-ion concentration was also found to be of the same order of magnitude as the loss in total alkalinity as determined by direct titration.

The Action of Pulp Fibers on Dilute Sodium Abietate Solutions

At the concentrations of the beater, the rosin size is hydrolyzed only to a minor extent, and the major portion of a neutral size could be present in the beater as sodium resinate providing there are no factors which affect the slight hydrolytic alkalinity of the solution. The stability of dilute sodium resinate solutions is very largely dependent on the hydrolytic alkalinity. If this alkalinity is removed or neutralized the soap will undergo further hydrolysis until equilibrium conditions are established.

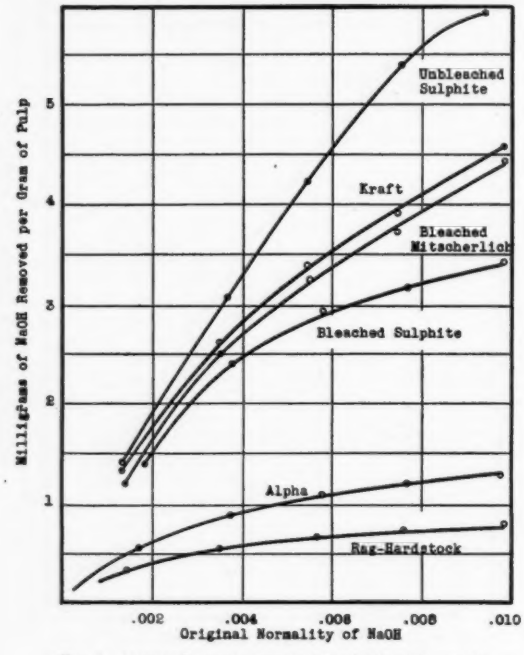


Fig.9. Alkali Removal from Dilute Sodium Hydroxide Solutions by Commercial Pulps

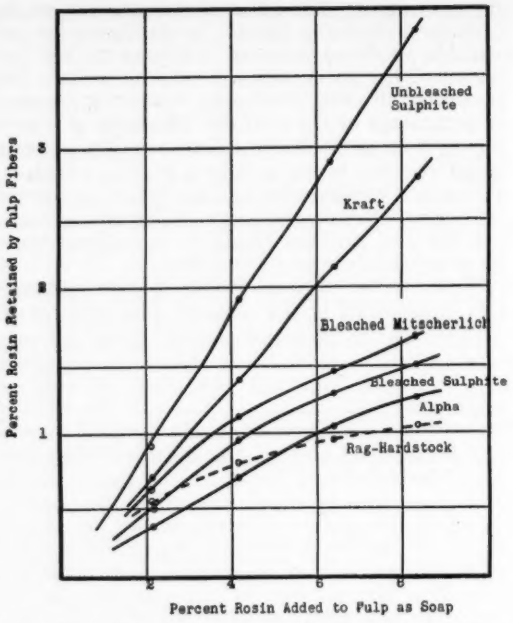


Fig.10. The Action of Commercial Pulp Fibers on Dilute Rosin Soap Solutions

In the previous section the pronounced activity of pulp fibers toward lowering the alkalinity of dilute alkaline solutions was discussed. In very dilute solutions a very large portion of the available alkalinity is removed by the presence of the pulp fibers. The percentage lowering of the alkalinity by the fibers appears to approach 100 per cent as the dilution of the alkaline solution increases. Commercial pulp fibers differ from one another in their activity toward lowering the alkalinity of these solutions. In the case of dilute rosin soap solutions, the alkalinity of the solution is probably also reduced by the contact with the pulp fibers. But as the alkalinity is reduced, the soap solution will become unstable and further hydrolysis will take place to make up for the loss in alkalinity and re-establish the necessary equilibrium conditions. Since the various commercial pulp fibers differ from one another quite markedly in their activity toward the alkalinity, it is quite probable that the extent to which the hydrolysis of the soap is forced by the action of the pulp fibers, will depend upon the nature and activity of the pulp fibers.

The action of various commercial pulp fibers toward dilute sodium resinate solutions is illustrated in Figs. 10 and 11. These curves were obtained by allowing the pulp fibers to stand in contact with the dilute rosin soap solutions for a period of twenty-four hours, filtering off the fibers and extracting the fiber mats with ether after they were dried. In a few cases the amount of rosin left in the solutions was determined. In these figures, the per cent rosin retained by the pulp fibers (the ether extract corrected for the ether solubility of the blank pulp) is plotted against the percentage of sodium resinate present in the solution based on the weight of the pulp. It is quite probable that the rosin found in the pulp fibers is primarily free rosin.

The pulps used in obtaining the curves in Fig. 10, were the same as those used in obtaining the alkali removal

curves in Fig. 9. The action of the pulp fibers on the dilute sodium resinate solutions appears to be quite similar to the behavior of these pulp fibers toward dilute hydroxide solutions. In both cases, the order of activity of the various pulps are the same; the unbleached sulphite samples retained the largest amount of rosin and also exhibit the greatest activity toward alkali solutions while the rag-hardstock shows the lowest rosin retention and also the lowest activity toward the alkali solutions. Since the various pulps are arranged in the same order in both cases, it is quite probable that the pulp fibers force the hydrolysis of the rosin soap, and the rosin found in the fiber mats is the liberated free abietic acid. In the case of the very dilute sodium resinate solutions, a relatively large portion of the alkalinity is removed by all of the various fibers, and the solutions must be rendered very unstable; but with the exception of the rag fibers, it was possible to distinguish between the activity of the various pulps down to a concentration of N/500 sodium resinate.

From these results, it does not necessarily follow, that all pulps of the same class behave the same in this respect. Fig. 11 shows the results obtained by using a different sample of unbleached sulphite, and another sample of bleached sulphite. But in general, it seems that the cellulosic purity of the pulp fibers roughly determines the activity of the fibers toward sodium hydroxide and resinate solutions. The order in which the various pulps are arranged is approximately the same as the order of ease of sizing, set up by general experience. In general, rag-hardstock is more difficult to size than alpha fiber, and the latter is more difficult to size than ordinary bleached pulps.

The free rosin liberated by the pulp fibers under these conditions, most likely differs in physical nature from the free rosin present in prepared free rosin sizes. The former is liberated under slowly changing conditions, so that particle size of this colloidal rosin is very small immediately after liberation. The free rosin particles in a prepared free rosin size are probably much larger due to the methods of preparation.

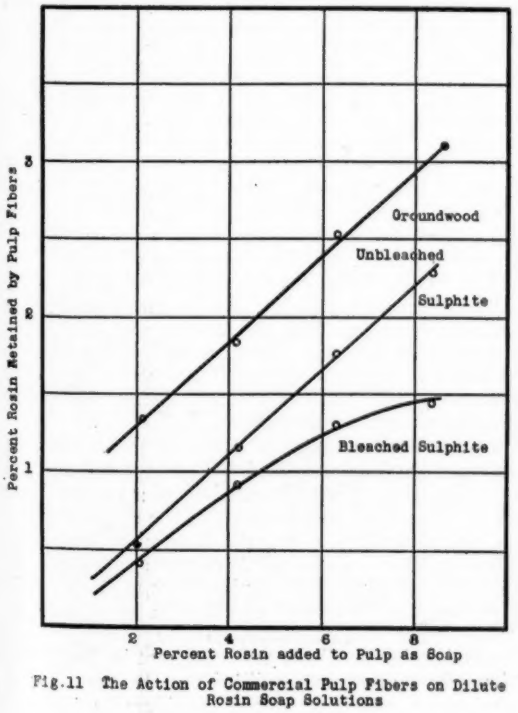


Fig. 11 The Action of Commercial Pulp Fibers on Dilute Rosin Soap Solutions

The pulp fibers in the beater, therefore, have a tendency to force the hydrolysis of the rosin size. Under normal conditions, the natural hydrolysis of the size may proceed up to 10 to 15 per cent. The presence of the pulp fibers may force the hydrolysis up to 60 per cent or higher depending on the pulp and the beater conditions, but in most cases there is still present in the beater some sodium resinate before the alum is added, providing hard water conditions do not produce complete coagulation. In many cases, the presence of rosin soap can be detected in the beater white water, by acidulating with mineral acid or with alum.

Experimental

PREPARATION OF ABIETIC ACID:

Seven hundred grams of white rosin (WW or WG grades) in small lumps, were boiled with 500 cc. of 98 per cent acetic acid under a reflux condenser for a period of three hours. The mixture was then filtered while hot through a large plaited filter paper and the filtrate cooled to room temperature or lower. A few crystals of abietic acid were added to start the crystallization or, when none were available, the solution was allowed to stand overnight, whereby spontaneous crystallization took place. The product was then filtered on a Buechner funnel using suction, and the filtrate set aside for a second crop. The material on the filters was sucked as free from mother liquor as possible, and washed with successive portions of cold 85 per cent ethyl alcohol until the filtrate was practically colorless. The product was again boiled with acetic acid under reflux, cooled, crystallized, filtered and washed as previously described. The product was then crystallized three times from absolute ethyl alcohol and air dried.

ACID NUMBER:

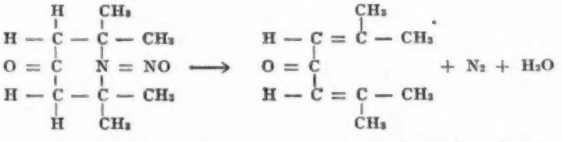
The acid number was determined by dissolving exactly one gram of the sample in 125 cc. of 95 per cent ethyl alcohol, and titrating with standard N/10 sodium hydroxide solution, using phenolphthalein as indicator. The acid value (milligrams of sodium hydroxide required to neutralize one gram of acid) was found to be 132.1 as compared to the theoretical value of 132.4. Assuming a monobasic acid, the molecular weight calculated from the above data is 302.9, as compared with generally accepted value of 302.3 for the molecular weight of abietic acid.

PREPARATION OF STANDARD SODIUM ABIETATE SOLUTIONS:

An N/10 solution of sodium resinate was prepared by dissolving 30.23 grams of the acid in 500 cc. of .2000 N sodium hydroxide solution and then diluting to exactly one liter. A clear solution with a red brown color was obtained. Solutions of lower concentration were prepared by carefully diluting this stock solution. Solutions of N/100 concentration and below are slightly turbid and opalescent even at room temperature.

THE DETERMINATION OF THE HYDROLYSIS OF SODIUM ABIETATE

In the presence of alkali, nitrosotriacetonamine is quantitatively decomposed into the unsaturated ketone, phorone, with the evolution of nitrogen gas. This decomposition was observed by Heintz (*29*) and may be expressed as follows:



Clibbens and Francis (*30*) made a careful study of this reaction and found the same to be monomolecular, and also found that over a certain range of hydroxyl-ion concentration the rate of catalysis is directly proportional to the hydroxyl-ion concentration. The course of the reaction could be followed by measuring the volume of nitrogen gas evolved, or by recording the pressure of the same. The former method was employed in the original studies. The apparatus used by Clibbens and Francis was similar to that described by Walton (*31*) in the latter's studies on the catalysis of hydrogen peroxide by iodine. The reaction was generally carried out in a Pena glass flask, which had an arrangement in the neck to hold one of the reactants in a dropping tube until it was desired to start the reaction. For very dilute solutions of alkali, a silver reaction flask and a dropping tube were employed. It is necessary to agitate the contents of the flask, to insure immediate liberation of the gas; this is usually accomplished by shaking the entire flask. The reaction vessel was connected to a gas burette by means of capillary glass tubing. The aqueous solution of the alkali was contained in the dropping tube, but in some cases this procedure was reversed. The flask was set up and shaken in a con-

stant temperature bath and the gas burette was held in a constant temperature jacket.

Francis and Geake (*32*) investigated the catalytic decomposition of nitrosotriacetonamine using barium hydroxide, sodium hydroxide, potassium hydroxide, phosphates tetraethyl ammonium hydroxide, and tetramethyl ammonium hydroxide. The measurements were made by the volume method similar to that used by Clibbens and Francis. For all these various bases and salts, it was found that the rate of the catalytic decomposition was a function of the hydroxyl-ion concentration. The rate of decomposition of the amine was found to be directly proportional to the hydroxyl-ion concentration up to an hydroxyl-ion concentration of .05 N. Above this hydroxyl-ion concentration the reaction is still monomolecular, but the reaction constants commence to "drift", that is, the reaction constant is no longer directly proportional to the hydroxyl-ion concentration. The method is therefore available for the estimation of the concentration of hydroxyl-ion up to a concentration of .05 normal, to a degree of accuracy of 2-3 per cent. The importance of the method as a means of determining the hydroxyl-ion concentration lies in the fact, that the effect of neutral salts in ordinary concentration is unimportant.

Francis, Geake, and Roche (*33*) describe a new apparatus for measuring the concentration of hydroxyl-ions, based on the catalytic decomposition of nitrosamine, which involves the measurement of pressure rather than volume. With this apparatus the authors were able to obtain results on the hydrolysis of sodium carbonate in good agreement with those obtained by conductivity and electromotive force measurements. They also investigated the use of various other amines, and by using nitroso-vinyl-diacetonamine or nitroso-isobutyl-diacetonamine they were able to bridge the region of ionic concentration which, owing to the drift in the constants, cannot be measured through the agency of nitroso-triacetonamine. In the case of nitrosotriacetonamine, the reaction constant commences to drift at a hydroxyl-ion concentration of .05 N. For nitroso-vinyl-diacetonamine and nitroso-isobutyl-diacetonamine the reaction constant does not drift until a hydroxyl-ion concentration of 0.4 N is attained.

Broensted and King (*34*) in their studies on the secondary kinetic salt effect, investigated the catalytic decomposition of nitroso-triacetonamine by hydroxyl-ions. They describe another piece of apparatus which was designed to measure quite generally the velocity of a reaction in which a gas is evolved, by a measure of the pressure above the solution as the reaction proceeds. This apparatus is essentially a modification of that described by Walton (see above) with a manometer to measure the pressure above the solution, instead of measuring the volume of the evolved gas with a burette. The reaction vessel is shaken in a thermostat by means of a special cam arrangement.

Kilpatrick (*35*) in his work on catalysis in buffer solutions, also investigated the catalytic decomposition of nitroso-triacetonamine. This investigator employed a method of following the course of reaction, involving a measurement of the volume of the gas evolved, but instead of agitating the entire flask, the solution is agitated by means of a stirrer with a mercury seal. The rates of the reaction and the temperature coefficients were determined from 20-80 deg. C. It was also found that the temperature coefficients were unaffected by neutral salt and the author finds his results in agreement with Broensted's concept of secondary salt effect. Broensted and King were able to show a salt effect for an 0.01 N sodium hydroxide solution at 15 deg. C. amounting to 7 per cent in an 0.1 N salt solution.

The apparatus used for this work was similar to that

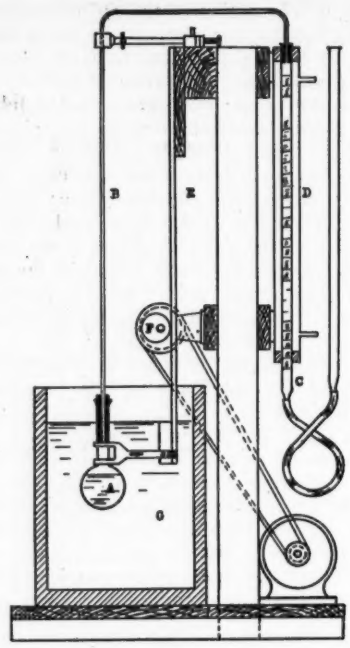


Fig. 12

used and described by Francis (see above), involving the measurement of the volume of nitrogen gas envolved. A sketch of the apparatus is given in Fig. 12. The reaction vessel A was a 100 milliliter pyrex volumetric flask, which was connected to the gas burette C by means of the capillary glass tubing B. An effective joint between the flask and the capillary tubing was attained by the use of a short piece of rubber tubing of the proper dimensions, which was slipped over the end of the capillary tubing and then forced tightly into the neck of the reaction flask. A similar joint was made between the capillary tubing and the burette. The flask is held in a clamp attached to the vertical wooden shaft E. This shaft is attached firmly at the upper end, but the lower end was capable of vibrating through a lateral distance of about two or three centimeters. The vibration was produced by means of a cam arrangement on a horizontal shaft driven by a small electric motor, as shown in the diagram. The speed of the shaft driving the cam was 350 r.p.m. This produced a very violent and effective agitation in the reaction flask, which was only filled to three-quarters of its total capacity. The vertical length of the capillary glass tubing B was about three feet, and it was sufficiently elastic to withstand this vibration. The reaction vessel was held in a constant temperature water bath, which could be held within .02 deg. C. The gas burette C is inclosed in a constant temperature water jacket, the water for the same was circulated through another thermostat.

The nitroso-triacetonamine used for this work was obtained from the Eastman Kodak Research laboratory, and the quantity of nitrogen liberated from a given amount of chemical was within one per cent of the theoretical value.

The procedure for making the determination was briefly as follows: 50 cc. of the alkali or soap solution were accurately pipetted into the reaction flask, and the flask was then shaken until thermal equilibrium was attained. A solution of the nitroso-triacetonamine (containing about 6 grams of amine per liter) was also kept in the thermostat and brought to thermal equilibrium. In the case of the soap solutions, which developed considerable foam due to

the agitation, a few drops of kerosene were added to eliminate the possibilities of foam getting into the capillary tubes. When it was desired to start the reaction, 25 cc. of the amine solution were carefully measured off with a pipette and run into the reaction flask, the flask was then immediately connected to the delivery tubes, and the agitation started. Volume readings are taken at suitable intervals depending on speed of the reaction. The time intervals were measured with a stop watch; in nearly every case, with the exception of exceedingly slow reactions the decomposition was allowed to go to completion. In the case of the very slow reactions the final volume was obtained by liberating and measuring the nitrogen from the same quantity of the same nitrosamine solution with a stronger alkali.

For a monomolecular reaction, the velocity of the same is given by the following equation:

$$k = \frac{1}{t} \ln \frac{a}{a-x}$$

where k is the velocity constant, a is the quantity of reactive constituent present at zero time, x is the quantity of reactive constituent converted in time t, and a-x is the quantity of reactive constituent remaining at time t. This equation can be more conveniently expressed in terms of burette readings as follows:

$$k = \frac{1}{t} \ln \frac{V_\alpha - V_o}{V_\alpha - V_x}$$

where V_α is the final burette reading. V_o the initial burette reading, and V_χ is the reading at any particular time t. The following is a typical experimental run:

The reaction flask contained .200 gram of amine, 50 cc. of water, 4 drops of kerosene, and 25 cc. of .0150 N NaOH. Temperature maintained at 55.8 deg. C.

Minutes	Reading	V	$V_\alpha - V_o$	$\frac{V_\alpha}{V_\alpha - V_x}$	$\ln \frac{V_\alpha}{V_\alpha - V_x}$	k
0.0	2.5	0.0	24.95	1.00	0	....
7.0	12.90	10.40	14.55	1.715	.540	.0771
8.0	14.00	11.50	13.45	1.855	.618	.0773
9.0	15.05	12.55	12.40	2.012	.700	.0778
10	16.00	13.50	11.45	2.185	.782	.0782
11.5	17.20	14.70	10.25	2.435	.890	.0773
13	18.35	15.85	9.10	2.745	1.010	.0777
15	19.67	17.17	7.78	3.21	1.17	.0777
17	20.80	18.30	6.65	3.75	1.322	.0777
19	21.80	19.30	5.65	4.42	1.485	.0780
22	22.90	20.40	4.55	5.48	1.70	.0773
25	23.80	21.30	3.65	6.84	1.92	.0768
30	24.90	22.30	2.55	9.79	2.28	.7760
180	27.45	24.95			Average	.0775

In order to check the apparatus and the procedure employed, a series of experiments were carried out using dilute sodium hydroxide solution of known strength. The following table gives a few data for the reaction constant at several concentrations of sodium hydroxide, together with the values of k/NaOH and k/OH. The values were obtained at 29.8 deg. C.

Normality NaOH	Normality OH	k	k/NaOH	k/OH
.0100	.0096	.0178	1.78	1.85
.0100	.0096	.0183	1.83	1.91
.0200	.0190	.0357	1.78	1.88
.0300	.0282	.0523	1.74	1.85
.0200	.0190	.0352	1.77	1.86
			Average	1.87

The k/OH value obtained by Francis at 30 deg. was 1.91 and that reported by Kilpatrick at the same temperature was 1.89.

The extent of the hydrolysis of N/100 sodium abietate solution was then determined at 30 deg. C. The complete data for one of these determinations are as follows: The reaction flask contained .2000 gram of amine, 50 cc. of water, 4 drops of kerosene, and 25 cc. of .030 N sodium abietate. The reaction proceeded at a temperature of 29.8 deg. C.

Minutes	Reading	V	$V_\alpha - V_x$	$\frac{V_\alpha}{V_\alpha - V_x}$	ln	k
0	1.10	.00	28.50	1.000	....	.....
135	1.53	.43	28.07	1.016	.0159	.000118
210	1.74	.64	27.86	1.024	.0237	.000113
400	2.20	1.10	27.40	1.040	.0393	.000098
425	2.25	1.15	27.35	1.042	.0412	.000097
550	2.67	1.57	26.93	1.058	.0564	.000103
870	3.40	2.30	26.20	1.089	.0854	.000098
1210	4.20	3.10	25.40	1.122	.1150	.000095
1270	4.34	3.24	25.26	1.130	.1250	.000099
1330	4.59	3.49	25.01	1.140	.1338	.000100
1450	4.75	3.65	24.85	1.147	.1371	.000096
1525	5.00	3.90	24.60	1.158	.1468	.000096
1585	5.06	3.96	24.54	1.163	.1510	.000095
1645	5.18	4.08	24.42	1.172	.1590	.000097
		28.50			Average	.000100

The hydroxyl-ion concentration may then be estimated by taking the hydroxyl-ion constant from above as 1.87 and calculating as follows:

.000100/1.87 — .000054 N OH ion.

The per cent hydrolysis of the N/100 sodium abietate solution at 29.8 deg. C. is then found to be

.000054 × 100/.01 = 0.54 per cent.

The average value of the per cent hydrolysis of N/100 sodium resinate from several similar determinations was found to be 0.50 per cent. This value appears to be of the proper order of magnitude when compared with the value of 5.7 per cent for an N/100 sodium resinate solution at 90 deg. C.; obtained by Beedle and Bolam (*1*). Due to the apparently slight hydrolysis of the resinate solutions, and the velocity of the decomposition of the nitrosotriacetonamine at 30 deg. C. it is rather difficult to measure the hydrolysis of more dilute solutions. However, the above data seem to indicate that the hydrolysis of the soap does not proceed to a very appreciable extent in the concentrations prevailing in the beater. To determine the degree of hydrolysis of more dilute sodium resinate solutions, it was found necessary to resort to a more elevated temperature, where the velocity of the reaction is considerably greater and the extent of the hydrolysis is also greater.

A series of experiments was then carried out using dilute sodium hydroxide solutions of known strength, in order to obtain the hydroxyl-ion constant of the reaction at this temperature. The reactions were carried out at 55 deg. C. which corresponds to 133 deg. F. The following table shows the reaction constant at several alkali concentrations at this temperature, together with the values of k/OH. For these very dilute solutions at this temperature, the degree of ionization was taken as 100 per cent.

Normality of NaOH	k	k/OH
.00200	.0294	14.7
.00200	.0280	14.0
.00300	.0459	15.3
.00500	.0752,	15.0
.00500	.0772	15.4
.00366	.0560	15.3
	Average	15.0

The value calculated from the data reported by Kilpatrick (*35*) for this particular temperature was found to be 14.9. For these very dilute solutions of sodium hydroxide, the presence of small amounts of carbon dioxide has an appreciable effect. The solutions had to be prepared from freshly redistilled water which was boiled just prior to making up the solutions. The experiments had to be carried out immediately after preparing the solutions.

The extent of the hydrolysis of an .0033 N sodium abietate solution was then determined. The complete data for one of these determinations are as follows: The flask contained .200 gram of amine in 50 cc. of freshly boiled distilled water, 4 drops of kerosene, and 25 cc. of .0100 sodium resinate solutions. The reaction proceeded at a temperature of 55.8 deg. C. The temperature of the water in the gas burette jackets was held at 22.5 deg. C. throughout the experiment.

Minutes	Reading	V	Va — Vx	$\frac{Va}{Va - Vx}$	ln	k
0	.80	0	26.40	1.00	.....	.....
30	2.68	1.88	24.52	1.078	.0752	.00250
45	3.50	2.70	23.70	1.114	.1080	.00240
75	5.08	4.28	22.12	1.194	.1775	.00237
168	9.30	8.50	17.90	1.475	.3820	.00227
186	10.00	9.20	17.20	1.535	.429	.00231
360	15.38	14.58	11.82	2.23	.802	.00223
420	16.74	15.94	10.46	2.525	.936	.00223
1170	25.10	24.30	2.10	12.57	2.74	.00234
1265	25.73	24.93	1.47	17.96	2.89	.00237
1410	26.15	25.35	1.05	25.10	3.22	.00228
	27.20	26.40			Average	.00231

The hydroxyl-ion concentration of this soap solution may then be calculated from this value and the hydroxyl-ion constant—

$$.00231/15.0 = .000154$$

and the per cent hydrolysis of the .00330 N sodium abietate solution may then be estimated as:

$$.000154 \times 100/.0033 = 4.7 \text{ per cent.}$$

The average value of the per cent hydrolysis of N/300 sodium abietate solution at 65 deg. C. was found to be 4.3 per cent. This value also appears to be of the proper order of magnitude when compared with the figure, 0.50 per cent for the hydrolysis of N/100 sodium resinate at 30 deg. C., previously obtained, and the results obtained by Beedle and Bolam. These results indicate that under ordinary beater conditions, the natural hydrolysis of sodium resinate does not proceed to any appreciable extent, and that if there were no other disturbing factors, such as impurities in the water and the effect of the pulp on the soap, a predominant percentage of the size could exist as sodium resinate. The conductivity measurements described below, also seem to indicate that the extent of the natural hydrolysis of sodium resinate is not very appreciable at concentrations prevailing in the beater.

An experiment was made in an attempt to discover the effect of the presence of pulp fibers on the hydroxyl-ion concentration of dilute sizing solution. The procedure was as follows: Four grams of bleached sulphite pulp were thoroughly mixed with one hundred cc. of an 0.01 N sodium resinate solution and allowed to stand two hours. The pulp fibers were then filtered off, and twenty-five cc. of the filtrate were used in the catalysis apparatus. The reaction flask contained .200 gram of amine in 50 cc. of water and the 25 cc. of the above filtrate. The experimental conditions were exactly the same in the previously described hydrolysis experiment, with the exception that in this case the soap had been in contact with pulp fibers. The hydroxyl-ion concentration was found to be .000054 N. This indicates an appreciable lowering of the hydroxyl-ion concentration, since the hydroxyl-ion concentration of the untreated solution was found to be .000154 N, as given above. Apparently the presence of the pulp fibers lowered the hydroxyl-ion concentration by about sixty per cent, which in turn should have an appreciable effect on the extent of the hydrolysis of thin soap solution. The effect of a large portion of the original hydroxyl-ion concentration is removed by the presence of the pulp either by a process of sorption by the fibers, or by a neutralization due to impurities in the pulp, or a combination of these processes. The removal of the alkali by the pulp should tend to disturb the normal hydrolysis equilibrium of the sodium resinate and should force the hydrolysis to an extent depending, along with other factors, on the amount of alkali removed. The behavior of various pulps toward dilute sodium hydroxide solutions has been studied with the intention to ascertain the effect of this alkali removal on the sodium resinate solutions and will be described later.

The Conductivity of Sodium Resinate Solutions

Dilute solutions of sodium abietate, N/100 and below, show a slight turbidity even at room temperature, and this turbidity increases gradually with rising temperature. Solutions having a concentration greater than N/100 appear to be perfectly clear and homogeneous. The concentration at which the turbidity appears is not definite and sharply defined, but at room temperature the effect is noticeable in the range of N/100 solutions. Freshly prepared solutions are opalescent, but on standing or with rise in temperature the colloidal particles seem to coalesce and gradually become quite coarse and finally settle out. From rough qualitative observation, the amount of material responsible for this turbidity appears to be only a small fraction of the total resin present, since on the addition of dilute mineral acid a comparatively large floc is produced. This would be expected in the light of the previously described work in the extent of the hydrolysis, for at room temperature, the turbidity of an N/300 sodium resinate solution must be due to less than five per cent of the total resin present. In these dilute solutions, the course of the hydrolysis may proceed according to the generally accepted reaction:

$$NaR + HOH \rightleftarrows HR + NaOH \quad \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

where R is the abietic acid radical, and the abietic acid HR, is present in a colloidal condition; or the reaction may proceed the following course as suggested by McBain:

$$2NaR + HOH \rightleftarrows NaHR_2 + NaOH \quad \ldots\ldots\ldots\ldots\ldots\ldots (2)$$

where the acid soap is in suspension, either course or colloidal as the case may be, and consists of something between the neutral salt NaR and the acid soap $NaHR_2$. Probably in these very dilute solutions, the formation of the acid soap does not proceed to any great extent, and the hydrolysis primarily follows equation 1. In either case, any great changes in the equilibrium due to dilution should be reflected in the conductivity curves of these solutions.

A few measurements were made on the electrical conductivity of sodium abietate solutions of concentrations ranging between N/10 and N/500. The apparatus employed consisted of an ordinary, Arrhenius type, conductivity cell with platinized platinum electrodes, and a small potentiometer used as a Wheatstone Bridge. An alternating current with a frequency of one thousand cycles was used. The solutions were prepared separately rather than by dilution in the cell. For comparison, measurements were also made on dilute sodium hydroxide solutions in the same concentration range. The following tables show the results obtained for the specific and equivalent conductances of sodium hydroxide and resinate solutions at 25 deg. C.

SODIUM ABIETATE SOLUTIONS

Concentration	Specific Conductance	Equivalent Conductance
.002 N	.000153	76.5
.004	.000296	74.2
.006	.000437	73.2
.008	.000565	70.6
.010	.000685	68.5
.0557	.00282	50.7
.1113	.00508	45.7

SODIUM HYDROXIDE SOLUTIONS

Concentration	Specific Conductance	Equivalent Conductance
.00135 N	.000330	245
.00364	.000895	245
.00548	.00135	245
.00756	.00184	244
.009944	.00228	242

The specific conductances are plotted in Fig. 1, and Fig. 2 shows the trends of the equivalent conductances of the hydroxide and resinate solutions. The equivalent conductance of sodium hydroxide at infinite dilution obtained by exterpolation from these data is 246 as compared with the accepted value of 243. The equivalent conductance curve for sodium hydroxide is almost horizontal in this concentration range, while that of the sodium abietate increases slightly with increasing dilution. The conductivity of the sodium resinate is rather high, but soap solutions in general have abnormally high conductivities. From the above

data, the apparent conductivity (equivalent) at infinite dilution of the sodium abietate is about 90; although the approximation of this value by exterpolation is quite unreliable, it is interesting to compare this figure with the equivalent conductance of sodium acetate at infinite dilution, which is 92 at 25 deg. C.

The equivalent conductance of the resinate solutions increase slightly with increasing dilution, but the slope of the curve is not particularly abnormal, which seems to indicate, that no great fundamental changes are taking place in the constitution of the electrolyte. The extent of the hydrolysis undoubtedly increases with increasing dilution, nevertheless the rate at which this change increases throughout the particular concentration range under consideration, is not very rapid.

Determinations of the hydroxyl-ion concentration of sodium resinate solutions based on the catalytic decomposition of nitrosotriacetonamine, indicate that the extent of hydrolysis of an N/300 solution is somewhat less than 5 per cent at 56 deg. C., and that the hydrolysis of an N/100 sodium resinate solution is about .5 per cent at 30 deg. C. The conductivity measurements seem to indicate that no great changes are taking place in the constitution of the electrolyte in the concentration range between N/100 and N/1000. The extent of the hydrolysis of the soap apparently does not increase very rapidly on dilution over this concentration range, and is probably less than ten per cent in soap concentrations below N/1000. The concentration of rosin size under beater conditions ranges from N/1000 to N/100, assuming a neutral size. At beater concentrations, therefore, the extent of the normal hydrolysis of the rosin soap is not very great, and probably less than 10 per cent under most conditions. Providing there are no factors which would tend to force the hydrolysis of the soap, the bulk of the size added to the beater as sodium resinate can exist as the true soap, with the formation of only a rather small percentage of hydrolyzed and colloidal resin. Commercial pulps, however, have a tendency to greatly reduce the alkalinity of dilute alkali solutions, and this behavior will have an appreciable effect on the sizing solutions. This behavior will be discussed in the following pages.

In the previously described measurements on the hydrolysis of sodium abietate solutions, it was found that the hydroxyl-ion concentration of the soap solution was considerably diminished by being in contact with commercial pulp fibers. It was also observed that when pulp fibers were allowed to stand in contact with dilute sodium resinate solutions for several hours and subsequently filtered off to give a clear filtrate, the amount of abietic acid that could be precipitated from the filtrate by a mineral acid was less than the precipitate obtained from a similar solution that had not been in contact with the pulp. This latter observation might suggest that the sodium soap, which has a large unsaturated molecule, is sorbed as such by the cellulose fiber interface. However, the fact that cellulose has a tendency to pick up alkali, and that the hydroxyl-ion concentration of a soap solution is reduced by the presence of pulp fibers, with a lowering in concentration of the soap solution, indicate the probability of the pulp fibers forcing the hydrolysis of the sodium resinate, with the liberation of appreciable quantities of colloidal abietic acid. This abietic acid is in an extremely fine colloidal condition when it is first liberated and could be readily sorbed or mechanically held by the pulp fibers. The tendency of pulp fibers to lower the alkalinity of dilute alkali solutions appears to be of fundamental importance to the problem of rosin sizing, and for this reason a study was made of the behavior of various commercial pulps toward dilute alkali solutions.

Alkali Removal by Pulp Fibers.

This study was limited to alkali concentrations which would approximate the conditions prevailing in the beater, that is, to solutions which contain amounts of alkali as sodium hydroxide equivalent to the amounts of sodium resinate in the beater water. These concentrations range between N/100 and N/1000. The lowering of the alkalinity of solutions by the presence of pulp fibers was determined by three independent methods; the first method involved direct titration, the second conductivity measurements, and the third method was based on the estimation of the hydroxyl-ion concentration by the rate of the catalytic decomposition of nitrosotriacetonamine. The first method is the simplest and was used throughout, the others were used for verification in a few cases.

In a preliminary experiment, the following procedure was chosen:

Ten-gram samples of shredded pulp were placed in Erlenmeyer flasks of 500 cc. capacity. To each of these was added a 250 cc. portion of an alkali solution, which gives a consistence of 4 per cent. A series of samples was thus prepared, with alkali solutions ranging from .002 N to .01 N NaOH at intervals of .002 N. A portion of each of the alkali solutions was kept for a blank determination. The mixture in the flasks were thoroughly shaken and then kept in a water bath at 20 deg. C. for a period of twenty-four hours. At the end of this period the fibers are filtered off on a bare Buechner funnel. The filtrates were poured through the mat a second time to give a clear solution. The alkali concentrations were then determined by titrating with N/100 standard sulphuric acid solution using phenolphthalein as an indicator. Several titrations were carried out with hot solutions to remove the effect of carbon dioxide with this indicator, but the differences in titer between the filtrates and the blank solutions is a measure of the loss in alkalinity. The following table gives the results of this experiment for two different pulps:

Bleached West Coast Sulphite (Hemlock)

Original Normality	Final Normality	Per cent Drop in Normality	Gr. NaOH removed per gram dry pulp
.00180	.00048	73.2	.00131
.00300	.00160	58.0	.00223
.00580	.00317	45.6	.00266
.00760	.00480	36.8	.00285
.00980	.00653	33.4	.00330
Purified Wood Fiber, Alpha Pulp			
.00180	.00127	28.9	.00053
.00380	.00298	21.6	.00084
.00580	.00477	17.8	.00105
.00760	.00658	13.4	.00106
.00980	.00864	11.8	.00119

These data are represented graphically in Figs. 3 and 4. In Fig. 3, the per cent of the available alkali removed is plotted against the original alkali concentration. In Fig. 4, the weight of sodium hydroxide removed per gram of dry pulp is plotted against the initial concentration. The per cent removal of the available alkalinity is very high for the sulphite pulp, especially in the more dilute solutions, and rapidly falls off with increasing concentration. The curve for the purified wood fiber is similar to that of the sulphite pulp, although the removal of alkalinity is very much less than that of the unpurified material. The great differences in the behavior of these pulps seem to indicate that the nature of the pulp is a predominant factor in effecting alkali removal. As already noted, the curves shown in Fig. 4 resemble typical adsorption curves. If the mechanism of this alkali removal were due to true adsorption, then a greater alkali removal would be favored by lower temperatures. It will be shown later that this is not the case. It does not seem likely that the loss in alkalinity is due to a neutralization effect, since this would require a rather sharp break in the curve, where the neutralization would be complete. Moreover, these quantities of alkali would require an abnormally high acid content in the pulp.

In the preceding experiment the time of contact of the pulp fibers with the solution was arbitrarily chosen as twenty-four hours. It was necessary to determine the time required for equilibrium conditions to be established, and experiments were made to determine the change in alkalinity of solutions with increase in the time of contact with the pulp fibers. The procedure for making these measurements was as follows: Erlenmeyer flasks of 500 cc. capacity, each containing 10 grams of shredded sulphite pulp, and a 250 cc. portion of a standard sodium hydroxide so-

lution were allowed to stand in a water bath at 20 deg. C. for periods of time ranging from two to seventy hours. A portion of the standard alkali solution was kept for a blank determination. When the time of contact of the solution with the fibers had elapsed, the fibers were filtered off on a bare Buechner funnel and the filtrate was poured through the mat a second time to obtain a clear solution. The alkalinity of the filtrates and the blank solutions were determined by titrating a 50 cc. aliquot portion of each with standard N/100 sulphuric acid solution, using phenolphthalein as an indicator. The following tables give the results of three series of measurements at different original alkali concentrations. The same pulp was used throughout.

ALKALI REMOVAL WITH TIME AT 20 DEG. C. BLEACHED HEMLOCK PULP. CONSISTENCY—4 PER CENT

Original Concentration—.00225 N NaOH

Time	Normality	Per cent drop in Alkalinity
0	.00225	00
2¾ hours	.00106	53
5¾ hours	.000895	60
11½ hours	.000750	67
24½ hours	.000480	79
48 hours	.000310	86
71 hours	.000225	90

Original Concentration—.00460 N NaOH

Time	Normality	Per cent drop in Alkalinity
0	.00460	00
2½ hours	.00277	40
5¼ hours	.00252	45
11 hours	.00232	50
24 hours	.00206	55
47 hours	.00186	60
70 hours	.00178	61

Original Concentration—.00980 N NaOH

Time	Normality	Per cent drop in Alkalinity
0	.00980	00
2½ hours	.00690	29.6
5 hours	.00670	31.6
11 hours	.00650	33.7
24 hours	.00636	35.1
47 hours	.00616	37.2
70 hours	.00605	38.2

In Fig. 5 the per cent of available alkalinity removed is plotted against the time of contact of the pulp with the solutions. In the case of the .00225 N. series, equilibrium conditions are not attained even after seventy hours of contact, the curve still has an appreciable slope at this point. In the .0046 N. series, an equilibrium is very nearly attained after seventy hours, and in the .0098 N. series the curve practically horizontal after this period of contact. In every case, the rate of the loss in alkalinity is very rapid in initial hours of contact; the rate of removal being rapid in the strong solutions.

The Effect of Temperature on Alkali Removal.

The curves obtained in the preliminary experiments (Fig. 4) resemble typical adsorption curves. As already noted, if the mechanism of the alkali removal were due to a process of true adsorption, lower temperatures would favor a greater removal of alkali, other conditions being the same. To check this point, two series of experiments were carried out, one at 20 deg. C. and the other at 40 deg. C. Since the time of contact was found to be an important factor in determining the drop in alkalinity, the effect of temperature could be most readily observed by determining the loss in alkalinity with time at these two temperatures, using the same initial alkali concentration in both series. The procedure for making these measurements was the same as that used in the previously described experiments on the removal of alkali with time. The original concentration of the sodium hydroxide solution was .0050 N. and the consistence of the pulp fibers was 4 per cent. One set of flasks was kept in a bath at 20 deg. C.; and the other set in a thermostat at 40 deg. C. The pulp used in these series was a bleached sulphite pulp from Western Hemlock.

ALKALI REMOVAL WITH TIME AT 20 DEG. C. BLEACHED HEMLOCK PULP. CONSISTENCY—4 PER CENT

Original Concentration—.00500 N NaOH

Time	Normality	Per cent drop in Alkalinity
0	.00500	00
2 hours	.00322	35.6
4 hours	.00288	42.4
8 hours	.00248	50.4
16 hours	.00233	53.4
28½ hours	.00216	56.8
64 hours	.00189	62.2

ALKALI REMOVAL WITH TIME AT 40 DEG. C. BLEACHED HEMLOCK PULP. CONSISTENCY—4 PER CENT

Original Concentration—.00500 N NaOH

Time	Normality	Per cent drop in Alkalinity
0	.00500	00
2 hours	.00259	48.2
4 hours	.00217	56.6
8 hours	.00193	64.4
16 hours	.00166	66.8
30½ hours	.00149	70.2
66 hours	.00116	76.8

In Fig. 6, the per cent of the available alkalinity removed is plotted against the time of contact at these two temperatures. Both curves have the same general form, a larger percentage of the available alkalinity is removed at the higher temperature, and the curves appear to diverge slightly as the time of contact of the pulp with the solutions increases. The removal of the alkali, therefore, cannot be due to a true mechanism of adsorption, and is probably a rather complex process, depending on the nature of the constituents present in the pulp, such as beta and gamma celluloses, pentosans, lignin residues, etc. The fact that the alkalinity is reduced is our main concern in this study, whatever the actual mechanism of the removal may be.

The Effect of Pulp Consistence on the Loss in Alkalinity.

In the previously described measurements, the consistence of the pulp fibers in the solutions was arbitrarily chosen as 4 per cent; in every case a pulp suspension was made by adding 10 grams of shredded, air-dry fiber to 250 cc. of solution. A series of measurements was made to determine the loss in alkalinity at various pulp consistencies. Definite quantities of shredded pulp were added to Erlenmeyer flasks of 500 cc. capacity, and to each flask was added a 250 cc. portion of a standard alkali (NaOH) solution, to give consistencies of pulp ranging from one to six per cent. The flasks were allowed to stand in a water bath at 20 deg. C. for a period of twenty-four hours. The fibers were then removed by filtering through a bare Buechner funnel, and pouring the filtrate through the mat a second time to obtain a clear solution. The alkalinity of the filtrates and the blank solution were determined as in the previously described experiments. The results of these measurements are given in the following table:

ALKALI REMOVAL AT VARIOUS CONSISTENCIES AT 20 DEG. C. BLEACHED HEMLOCK PULP (SULPHITE)

Time of contact of solutions with fibers—24 hours.

Original Concentration of Sodium Hydroxide—.00362 Normal.

Consistency	Normality	Per cent drop in Alkalinity
0	.00362	00
1—	.00307	15.2
2	.00252	30.3
3	.00204	43.7
4	.00157	56.6
5	.00120	66.8
6	.00101	72.2

These results are shown graphically in Fig. 7. The solid-line curve shows the per cent available alkalinity removed at the various consistencies. The slope of this curve changes very little at the lower consistencies, but falls off quite rapidly above a consistency of four per cent, where the residual alkali concentration becomes rather low. The broken-line curve shows the milligrams of sodium hydroxide removed per gram of dry pulp at the various consistences. This curve maintains a maximum of about 2.2 milligrams up to a consistency of about 4.5 per cent, and then

gradually drops off with increasing consistency. Apparently, a consistency of about four per cent is the most suitable for making determinations on the loss in alkalinity.

The Behavior of Commercial Pulps Toward Dilute Alkali Solutions.

In the preliminary studies of the action of pulp fibers on dilute sodium hydroxide solutions, two widely different pulps were used, namely, an ordinary bleached sulphite pulp and a purified wood fiber pulp. These two pulps have quite different chemical and physical characteristics. The purified wood fiber has a higher alpha-cellulose content and a lower copper number than the ordinary sulphite pulp. Their behavior in the beater is also quite different, the alpha-pulp develops in strength more slowly and is more difficult to hydrate than the sulphite pulp. As is shown in Figs. 3 and 4 these two pulps differ very widely in their action on dilute sodium hydroxide solutions. In an N/500 sodium hydroxide solution, under similar conditions of time of contact, consistence, etc., the sulphite pulp causes a reduction in alkalinity of the solution of over 75 per cent, as compared with a 30 per cent reduction in the case of the alpha pulp. In the range of alkali concentration under consideration, the action of the sulphite pulp is almost three times as great as that of the purified wood fiber. The removal of the alkalinity of solutions by pulp fibers appears to be a rather complex process, and is probably controlled to a great extent by the physical and chemical characteristics of the pulp fibers. Certain chemical constituents present in pulp fibers, such as lignin residues, beta and gamma-cellulose, pentosans and the residual hemicellulose, may influence the behavior of pulp toward dilute alkaline solutions. The removal of the alkali may be partially due to adsorption processes, in which case, the physical condition of the fiber interfaces, the degree of swelling, etc., may play a predominant role. The preliminary experiments indicate that commercial pulps differ from one another toward sodium hydroxide solutions. In the case of dilute sodium resinate solutions. a reduction in the normal alkalinity of the soap would tend to shift the equilibrium conditions and force the hydrolysis of salt. Since the lowering of the alkalinity depends on the nature of the pulp fibers, the extent of the forced hydrolysis of the sizing solution will also be determined by the nature of the pulp fibers. Pulp fibers which have a pronounced activity toward lowering the alkalinity of the beater water, would force the hydrolysis of the soap and consequently change the condition of rosin size from a true molecularly dispersed sodium salt to a colloidal suspension of abietic acid. In the case of a neutral size, the amount of colloidal rosin formed in this manner would be determined by the nature of the pulp fibers. A study was made of the activity of the ordinary types of commercial pulps toward lowering the alkalinity of dilute alkali solutions, to obtain further information concerning the probable behavior of these pulps on the constitution of sizing solutions.

In order to compare the action of various commercial pulps on dilute alkaline solutions, measurements were made to determine the loss in alkalinity at various sodium hydroxide concentrations, under more or less standardized conditions. The shredded pulp was allowed to stand in contact with the standard sodium hydroxide solutions for a definite period of time, as in the previous measurements. The consistency of the pulp fibers in the solution was 4 per cent, and the time of contact of the pulp fibers with the solution was chosen as thirty hours. In the more dilute solutions, it was shown that equilibrium conditions are not attained in this period of time, but longer periods were impractical, and since all the pulps received the same treatment the results are comparable. In every case, 10 grams of shredded pulp were shaken with 250 cc. of the standard sodium hydroxide solution and allowed to stand in a thermostat at 20 deg. C. for 30 hours. The fibers were then filtered off on a bare Buechner funnel, and the filtrate poured through the mat a second time to obtain a clear solution. The alkalinity of the filtrate was determined by titrating a 50 cc. aliquot portion with standard N/100 sulphuric acid solution, using phenolphthalein as indicator. The results of these determinations are given in the following tables:

THE EFFECT OF VARIOUS COMMERCIAL PULPS ON DILUTE SODIUM HYDROXIDE SOLUTIONS

COTTON CELLULOSE PULP—Rag Hardstock

Original Normality	Final Normality	Per cent Loss in Alkalinity	Milligr. NaOH per gram of Pulp
.00137	.00105	23.4	.32
.00340	.00281	17.1	.59
.00536	.00473	11.8	.63
.00744	.00675	9.3	.69
.00990	.00907	8.4	.83

BLEACHED MITSCHERLICH SULPHITE

Original Normality	Final Normality	Per cent Loss in Alkalinity	Milligr. NaOH per gram of Pulp
.00137	.00017	87.5	1.20
.00340	.00091	73.3	2.49
.00536	.00224	58.2	3.23
.00744	.00377	49.3	3.67
.00990	.00585	40.9	4.05

UNBLEACHED SULPHATE—Kraft

Original Normality	Final Normality	Per cent Loss in Alkalinity	Milligr. NaOH per gram of Pulp
.00135	.000107	92.0	1.26
.00340	.00083	75.5	2.57
.00566	.00224	60.5	3.42
.00744	.00364	51.1	3.81
.00990	.00572	42.2	4.17

UNBLEACHED SULPHITE

Original Normality	Final Normality	Per cent Loss in Alkalinity	Milligr. NaOH per gram of Pulp
.00130	.000107	92.5	1.30
.00364	.000524	85.5	3.11
.00547	.00118	78.5	4.29
.00755	.00215	71.5	5.40
.00943	.00349	63.0	5.94

BLEACHED SULPHITE—West Coast Hemlock

Original Normality	Final Normality	Per cent Loss in Alkalinity	Milligr. NaOH per gram of Pulp
.00180	.000360	80.0	1.44
.00380	.00140	63.9	2.43
.00580	.00284	51.0	2.96
.00760	.00444	41.6	3.16
.00980	.00635	35.2	3.45

PURIFIED WOOD FIBER—Super Alpha

Original Normality	Final Normality	Per cent Loss in Alkalinity	Milligr. NaOH per gram of Pulp
.00180	.00122	32.0	.576
.00380	.00289	23.9	.91
.00580	.00464	20.0	1.16
.00760	.00639	16.0	1.22
.00980	.00851	13.1	1.28

The above data are represented graphically in Figs. 8 and 9. In Fig. 8, the per cent of the available alkalinity removed is plotted against the original sodium hydroxide concentration, and Fig. 9 shows the milligrams of sodium hydroxide removed per gram of dry fiber for the original alkali concentrations. These curves illustrate the great difference in behavior of typical commercial pulps. All of the pulps studied give curves of the same general form, which seems to indicate that the mechanism of the alkali removal is the same for all pulps. The unbleached sulphite pulp shows the greatest activity in removing the alkalinity of the solutions. It not only removes the bulk of the alkali in the more dilute resolutions, but it also removes a relatively large quantity of the available alkali over the entire range of concentration. The kraft and the bleached Mitscherlich sulphite have very nearly the same activity toward alkali removal, the kraft pulp having a slightly greater action. The particular sample of bleached sulphite used in this study was a pulp of rather high quality, suitable for high grade writings and book paper. The ability of this pulp to remove alkali is appreciably lower than that of the bleached Mitscherlich sulphite. The behavior of the purified wood fiber, the alpha-pulp, is quite different from that of the other chemical wood pulps; its ability to remove alkali is very much lower than the activity of the other wood pulps. The rag hardstock shows a tendency to remove only very small amounts of alkali. This sample of rag-stock was suitable for high grade bond, banknote and ledger papers. The order in which these various pulps are aligned in their behavior toward dilute alkali solutions is rather interesting. The ability of pulp fibers to remove alkali appears to be determined, to a very great extent, by the chemical characteristics of the fibers, apparently, the higher the quality of the pulp, the lower

the tendency will be to reduce the alkalinity of sodium hydroxide solutions.

The Determination of Alkali Removal by Conductivity Methods.

In the previously described experiments the loss in alkalinity was determined by the method of direct titration.

To obtain further information concerning this action of cellulose fibers on dilute alkali solutions, a few measurements were made on the electrical conductivity of sodium hydroxide solutions before and after being in contact with pulp fibers for a definite period of time. An ordinary, Arrhenius type cell was used, in conjunction with a small potentiometer used as a Wheatstone bridge. The conductivity values were determined at exactly 25 deg. C. The shredded pulp fibers were allowed to stand in contact with the alkali solutions at 20 deg. C. for a period of 30 hours, at a consistence of 4 per cent. The fibers were then removed by filtration and the conductivities of the filtrates were determined. Measurements were also made on portions of the untreated solutions, and on distilled water that had been in contact with the pulp fibers under similar conditions. The results are as follows:

UNBLEACHED SULPHITE PULP

Original Normality	Specific Conductance Before Treatment	Specific Conductance After Treatment	After Treatment Corrected
.00141	.000330	.000176	.000056
.00364	.000895	.000355	.000235
.00548	.00135	.000550	.000430
.00756	.00184	.000825	.000705
.00944	.00228	.00117	.00105

The distilled water used in this experiment had a conductivity of .000001 mho, and after being in contact with the pulp fibers the conductivity increased to .000120. The conductivity of the distilled water shows a considerable increase after being in contact with the pulp fibers. It is quite difficult to correct for this disturbing factor, but as a rough approximation, the measured values of the conductances of the filtrates were corrected by deducting the value of the conductance of the white water. These corrected values are given in the last column in the above table. The conductance values are plotted against the original alkali concentration in Fig. 13. The solid-line curves show the actual measurements for the blank solutions and the filtrates. The broken-line curve gives the corrected values for the filtrates. The conductivity of the solutions is appreciably lowered by the contact with the pulp fibers. In Fig. 14, the per cent lowering of the conductivity is plotted against the original sodium hydroxide concentration. The reduction in the electrical conductivity should be an index of the removal of the alkalinity. The per cent loss in alkalinity for these same solutions, determined by titration methods, is also given in this figure for comparison. The curves differ by about ten per cent in actual values, but both curves indicate the pronounced activity of the pulp fibers on these solutions. The value of the conductivity method for determining the loss in alkalinity is limited by the correction that must be applied for the materials that are dissolved from the pulp by the solutions. The solubility of the materials in the pulp fibers will undoubtedly vary somewhat with the concentration of the alkali solutions. However, the results obtained by the conductivity method are in fair agreement with the data obtained by direct titration.

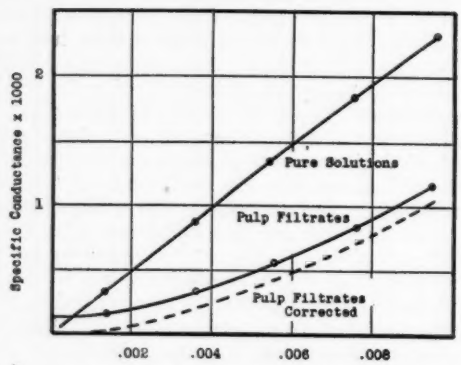


Fig.13 Specific Conductivity of NaOH Solutions before and after Contact with Pulp Fibers

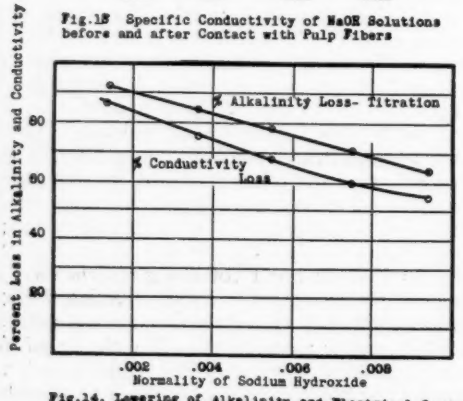


Fig.14. Lowering of Alkalinity and Electrical Conductivity of Sodium Hydroxide Solutions by Pulp Fibers

If dilute aluminum sulphate solutions are used in place of the alkali solutions the behavior is quite different. The specific conductivity of the filtrates is much higher than the values of the pure solutions. The aluminum sulphate is hydrolyzed in these dilute concentrations, and the alumina is adsorbed by the fibers with the liberation of free sulphuric acid. This liberated sulphuric acid is responsible for the high conductivities of the pulp filtrates in the case of aluminum sulphate solutions.

The Lowering of the Hydroxyl-ion Concentration of Dilute Sodium Hydroxide Solutions by Commercial Pulps.

The determination of alkali by titration methods involving phenolphthalein as indicator gives the total alkalinity above pH of 8. The previously described measurements on alkali removal represent changes in the total alkalinity of the solutions, rather than actual changes in the hydroxyl-ion concentration. A few determinations were made on the changes in hydroxyl-ion concentration due to the presence of pulp fibers, by the method based on the rate of the catalytic decomposition of nitrosotriacetonamine. In this method it was found that the measurements could be made in the presence of the pulp fibers.

In these experiments, one gram of shredded pulp was placed in the reaction vessel, and 50 cc. of the standard alkali solution were added. The mixture was allowed to stand in the thermostat at 50 deg. C. for a period of twenty-four hours with intermittent shaking. At the end of this period, twenty-five cc. of an aqueous solution of the amine were added, and the rate of the decomposition was determined. The hydroxyl-ion concentration was calculated from the reaction constant and the hydroxyl-ion constant for this temperature. The concentration of the blank solutions were also determined by this method. The following data show the effect of various commercial pulps on the hydroxyl-ion concentration of dilute sodium hydroxide solutions:

THE LOWERING OF THE HYDROXYL-ION CONCENTRATION BY COMMERCIAL PULPS

Consistence—2 per cent; Temperature—50 deg. C.

BLEACHED SULPHITE PULP

Original OH Normality	Final OH Normality	Per cent loss in OH ion
.01125	.0094	17
.0090	.0072	19.5
.0056	.0043	26
.0023	.00126	45

BLEACHED MITSCHERLICH SULPHITE

Original OH Normality	Final OH Normality	Per cent loss in OH ion
.0113	.0059	48
.0090	.0041	54
.0056	.00185	67
.0023	.00014	94

The changes in the hydroxyl-ion concentration are similar to the changes in the total alkalinity, but the magnitude of the former are somewhat greater, especially in the more dilute concentrations. These data also show the varied action of different kinds of pulp fibers. The bleached sulphite pulp used in these determinations was of very high quality. Its characteristics approach those of a purified wood fiber or alpha pulp. The activity of this pulp to reduce the hydroxyl-ion concentration of the solution is less than half of that of the Mitscherlich sulphite.

All of the previous measurements illustrate the tendency of pulp fibers to reduce the alkalinity of alkali solutions,

and also the great difference in behavior of the various pulps. A similar action of the pulp fibers probably occurs in dilute sizing solutions.

THE EFFECT OF COMMERCIAL PULP FIBERS ON DILUTE SODIUM RESINATE SOLUTIONS.

In general mill practice, it is customary to add the size to the beater after the stock and filler have been added, but usually before the alum. In some operations the size is added after a portion or all of the alum has been furnished to the beater, but this procedure is rather exceptional. The rosin is usually added quite early in the beating operation, and the alum is introduced shortly before the beater is to be dumped. The time of contact of the size with the stock depends on the time of beating, this may vary from a small fraction of an hour to several hours. There is usually a period of time in the beating operation in which the stock is in suspension in a dilute rosin soap solution, before the alum is added to precipitate the rosin.

In the dilute concentrations of the beater, the course of the hydrolysis of sodium abietate, probably follows the following equation

$$NaR + HOH \leftrightarrows HR + NaOH \leftrightarrows Na^{+} + OH^{-}$$

The solubility of abietic acid in water is extremely low, so that any abietic acid that is formed is in a colloidal condition. The sodium hydroxide that is formed, will be completely dissociated at these concentrations. According to the law of mass action, the above reaction is governed by the following relation:

$$k = \frac{(NaR)\,(HOH)}{(HR)\,(NaOH)}$$

where k is a constant depending upon the temperature, and the quantities in the brackets represent the molecular concentrations of the reactants. Since the abietic acid is very insoluble, the value (HR) will be maintained very nearly constant by the colloidal rosin, and at these concentrations the value (HOH) is practically constant, the equilibrium conditions may be expressed by the relation—

$$k' = \frac{(NaR)}{(NaOH)}$$

The concentration of the soap is maintained by the alkalinity of the solution. Any condition, which would reduce the sodium hydroxide concentration, would also reduce the concentration of the soap.

The natural hydrolysis of sodium abietate was found to be less than five per cent in an N/300 solution at normal temperatures. The concentration of the sizing in the beater, assuming a neutral size, would probably fall in the range between N/1000 and N/100. In beater concentrations, therefore, the extent of the natural hydrolysis of the rosin soap is only several per cent, and a large percentage of sodium resinate may be present providing a normal alkalinity of the soap is not reduced. In the beater, however, the normal behavior of the size will be affected by the condition of the water and of the stock. Any materials in the water which will affect the normal alkalinity of the size, will also force the hydrolysis of the soap.

The action of pulp fibers on the alkalinity of dilute sodium hydroxide solutions was discussed in the previous pages. It was found that the alkalinity was greatly reduced by the presence of the pulp fibers, and that the lowering of the alkalinity was determined by the nature of the pulp fibers, other conditions remaining constant. Also, the percentage lowering of the alkalinity increases with greater dilution of the alkali solutions. The per cent removal of the available alkalinity by pulp fibers appears to approach 100 per cent at infinite dilution. The action of the pulp fibers on dilute alkali solutions should tend to alter the normal equilibrium conditions of the dilute sodium resinate solutions. In dilute sizing solutions the alkalinity is rather low, and the presence of the pulp fibers should produce a great reduction in the free alkali concentration, with a corresponding drop in the concentration of the soap. Under similar conditions, the action of different pulp fibers will probably vary, since the activity of pulp fibers toward alkali removal is quite variable. A study was made on the action of various commercial pulp fibers on dilute sodium resinate solutions. The same series of commercial pulp fibers was used in this study, as was used in the work on the removal of the alkalinity in dilute sodium hydroxide solutions. These pulps show a wide range of behavior toward dilute alkali solutions, and one would expect that the action of these pulps toward sodium resinate solutions would be in the same order as in the case of the sodium hydroxide solutions.

The procedure for making the measurements on the action of pulp fibers on rosin soap solutions was briefly as follows:

Ten gram samples of the shredded pulp fibers were shaken with 250 cc. portions of standard sodium resinate solutions of concentrations ranging between N/500 and N/100. This gave a consistency of pulp fibers in the mixture of 4 per cent. The samples were allowed to stand in a thermostat at 25 deg. C. for a period of twenty-four hours. The fibers were then removed by filtering through a bare Buechner funnel, and the filtrates were poured through the mats a second time to obtain clear solutions. The fibers were sucked as dry as possible, and then dried in an oven at 105 deg. C. The fiber mats were then extracted with ether in Soxhlet extractors for four hours. The ether extracts were evaporated to dryness, dried at 105 deg. C. for a period of an hour and then weighed. In a few cases, the soap concentration of the filtrates were determined by precipitating the rosin from an aliquot portion of the filtrate with mineral acid and extracting with ether, and finally weighing the extract. This latter method was found to agree quite closely with the method of extraction of the fibers. The ether solubilities of the untreated fibers were also determined to correct for soluble materials originally present in the fibers. All of the determinations were made in duplicate. The results of these determinations are as follows:

Unbleached Sulphite Pulp:

Original Normality of Sodium Resinate	Per cent HR present based on pulp	Per cent Ether Extract	Per cent Ether Extract (Corrected)
.00278 N	2.1	1.59	0.85
.00556	4.2	2.65	1.91
.00835	6.3	3.63	2.89
.0111	8.4	4.60	3.86
Blank Pulp	....	.74	....

Purified Wood Fiber—Alpha Pulp:

Original Normality of Sodium Resinate	Per cent HR present based on pulp	Per cent Ether Extract	Per cent Ether Extract (Corrected)
.00278	2.1	.418	.36
.00556	4.2	.790	.73
.00835	6.3	1.08	1.02
.0111	8.4	1.33	1.27
Blank Pulp	....	.06	....

Bleached Mitscherlich Sulphite:

Original Normality of Sodium Resinate	Per cent HR present based on pulp	Per cent Ether Extract	Per cent Ether Extract (Corrected)
.00278 N	2.1	.946	.646
.00556	4.2	1.43	1.13
.00835	6.3	1.76	1.46
.0111	8.4	2.00	1.70
Blank Pulp	....	.30	....

Bleached Sulphite Pulp:

Original Normality of Sodium Resinate	Per cent HR present based on pulp	Per cent Ether Extract	Per cent Ether Extract (Corrected)
.00278	2.1	.78	.78
.00556	4.2	1.25	.95
.00835	6.3	1.60	1.30
.0111	8.4	1.81	1.51
Blank Pulp	....	.30	....

Unbleached Sulphate—Kraft:

Original Normality of Sodium Resinate	Per cent HR present based on pulp	Per cent Ether Extract	Per cent Ether Extract (Corrected)
.00278	2.1	.77	.69
.00556	4.2	1.38	1.30
.00835	6.3	2.02	2.12
.0111	8.4	2.98	2.82
Blank Pulp	....	.08	....

Cotton Cellulose—Rag Hardstock:

Original Normality of Sodium Resinate	Per cent HR present based on pulp	Per cent Ether Extract	Per cent Ether Extract (Corrected)
.00278	2.1	.74	.63
.00556	4.2	.90	.79
.00835	6.3	1.07	.96
.0111	8.4	1.16	1.05
Blank Pulp	....	.11	....

In the above tables, the first column gives the original normality of the sodium resinate in the solutions, the second column shows the amount of abietic acid present in the mixture as the sodium salt calculated in per cent based on the dry fiber. The third column gives the per cent ether solubility of the pulp mats, based on the dry fiber, together with the ether solubility of the untreated fiber. The last column shows the per cent ether solubility corrected for

the materials naturally occurring in the pulp. The six pulps used in this study were the same as those used in the study on the removal of alkalinity of the sodium hydroxide solutions. The above data are represented graphically in Fig. 10. In this figure, the per cent rosin removed by the pulp (the corrected ether extract) is plotted against the per cent rosin originally present in the solution, both percentages are based on the dry weight of the fiber.

The order of the activity of the various pulps toward the sodium resinate solutions appears to be related to the behavior of the pulp fibers toward sodium hydroxide solutions. The rosin determinations were made by the use of ether as a solvent, so that the major portion of the extracts were free rosin or abietic acid. The mechanism by the pulp fibers is probably quite complex. The abietic acid must first be liberated from the sodium salt by the natural or forced hydrolysis, due to the reduction in the normal alkalinity. This free rosin, as it is initially formed, is in a very fine colloidal condition, and could probably be adsorbed or mechanically held by the pulp fibers. Apparently, the retention of this rosin depends on the nature of the pulp fibers. In this connection, a comparison of the curves in Fig. 10 with those of Fig. 9 is of interest. In both cases, all of the wood pulps fall in the same order. The unbleached sulphite pulp, which shows the greatest activity toward alkali removal, also has the greatest effect on the sodium resinate. The purified wood fiber or alpha pulp exhibits the lowest activity toward both alkali and rosin soap solutions. The remaining wood pulps lie intermediate between the unbleached sulphite pulp and the alpha pulp. However, the removal of rosin by the pulp is not exactly proportional to the ability of the pulp fibers to lower the alkalinity of sodium hydroxide solutions. In their effect on sodium hydroxide solutions, the kraft and the bleached Mitscherlich sulphite pulps are fairly close together, but in the case of the size solutions greater difference appears. The bleached sulphite pulps are grouped closely together in their effect on the rosin soap solutions. The ray-hardstock shows a more or less abnormal behavior toward the rosin soap solutions. It removes a comparatively large amount of rosin from the more dilute soap solutions. It removes a comparatively large amount of rosin from the more dilute soap solutions, but the relative amount removed falls off quite rapidly with increasing concentration of the soap. The ability of a pulp to remove rosin from dilute sodium resinate solutions appears to be determined, to a certain extent, by the capacity of the pulp to lower the alkalinity of the solution. The lowering of the alkalinity of sodium hydroxide solutions by pulp fibers is probably due to several factors, and probably only some of these factors are responsible in forcing the hydrolysis of the soap solutions. The action of different pulp fibers on sizing solutions is quite variable, depending on the nature of the pulp.

The action of a few other pulps on dilute sodium resinate solutions was investigated. A mechanical-pulp made from spruce, an unbleached sulphite made from Western Hemlock, and a high grade bleached sulphite pulp made from spruce, were selected. The experimental procedure was the same as in the previous work on the effect of pulp fibers on rosin soap solutions.

These data are plotted in Fig. 11. The ground wood pulp exhibits a rather abnormal behavior, a relatively large amount of rosin is removed in the more dilute solutions, and then the slope of the curve becomes nearly constant. Ground-wood pulp is highly lignified, and a behavior different from chemical pulps would be expected. The unbleached sulphite pulp from Hemlock was an easy bleaching pulp of good quality. The bleached sulphite pulp made from spruce was a special select pulp, suitable for high grade writing papers.

Mechanical Pulp—Ground Wood:

Original Normality of Sodium Resinate	Per cent HR present based on pulp	Per cent Ether Extract	Per cent Ether Extract (Corrected)
.00278 N	2.1	1.79	1.35
.00556	4.2	2.25	1.81
.00835	6.3	2.96	2.52
.0111	8.4	3.44	3.00
Blank Pulp	....	0.44	....

Unbleached Sulphite—Hemlock:

Original Normality of Sodium Resinate	Per cent HR present based on pulp	Per cent Ether Extract	Per cent Ether Extract (Corrected)
.00278	2.1	0.76	.47
.00556	4.2	1.44	1.15
.00835	6.3	2.07	1.78
.0111	8.4	2.56	2.27
Blank Pulp	....	.29	2.27

Bleached Sulphite—Spruce:

Original Normality of Sodium Resinate	Per cent HR present based on pulp	Per cent Ether Extract	Per cent Ether Extract (Corrected)
.00278	2.1	0.55	.42
.00556	4.2	1.07	.94
.00835	6.3	1.46	1.33
.0111	8.3	1.55	1.42
Blank Pulp	....	.13	....

Conclusions

From the results obtained in this investigation, we may draw the following conclusions:

1. The natural hydrolysis of sodium resinate solutions is not very great at beater concentrations. The extent of hydrolysis of an N/100 sodium abietate solution was found to be 0.50 per cent, at 30 deg. C. For an N/300 sodium abietate solution at 56 deg. C., the extent of hydrolysis was found to be 4.3 per cent. In the case of a neutral size, a large portion of the size can exist in the beater as sodium resinate, providing there are no factors which will affect the hydrolytic alkalinity of the solution.

2. Pulp fibers show a tendency to lower the alkalinity of very dilute sodium hydroxide solutions. The activity of the various commercial pulps in this connection, appears to be determined by the nature of the pulp, its method of preparation, impurities, etc. In general, the higher the cellulose purity of the pulp, the lower the activity of the pulp toward dilute alkaline solutions.

3. Due to the tendency of pulp fibers to lower the alkalinity of dilute alkaline solutions, pulp fibers will tend to force the hydrolysis of dilute sodium resinate solutions. The extent to which the hydrolysis of the rosin size is forced, by the pulp fibers, appears to be closely related to the activity of the pulp fibers toward lowering the alkalinity of dilute alkaline solutions.

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RAGS, BAGGINGS, ETC.

Van Oppen & Co., Veendam, Rotterdam, 69 bls. bagging; J. J. Ryan & Sons, Veendam, Rotterdam, 564 bls. cotton waste; ———, Cristobal Colon, Bilbao, 539 bls. rags; Castle & Overton, Inc., City of Flint, Belfast, 116 bls. paper stock; E. J. Keller Co., Inc., Excambion, ———, 473 bls. rags, 90 bls. bagging; P. Berlowitz, Excambion, Alexandria, 171 bls. rags; G. A. Henshaw & Son, Artigas, Manchester, 66 bls. rags; Chase National Bank, Artigas, Manchester, 45 bls. rags; Castle & Overton, Inc., Artigas,

Manchester, 40 bls. rags; A. W. Fenton, Inc., Artigas, Manchester, 40 bls. bagging; Van Oppen & Co., Azumasan Maru, Kobe, 100 bls. rags; E. J. Keller Co., Inc., Liberty, ———, 38 bls. bagging.

OLD ROPE

E. J. Keller Co., Inc., American Farmer, ———, 65 coils; E. J. Keller Co., Inc., Cristobal Colon, ———, 146 coils; Brown Bros. Harriman & Co., Cristobal Colon, Pasages, 105 coils; Banco Coml. Italiane Trust Co., Saturnia, Trieste, 51 rolls; ———, Bristol City, Bristol, 75 coils; International Purchasing Co., Gourko, Hull, 439 coils; Brown Bros. Harriman & Co., Gourko, Newcastle, 68 coils.

GLUE STOCK, ETC.

———, Deutschland, Hamburg, 610 bags bone glue.

CASEIN

Tupman Thurlow & Co., Inc., West Calumb, B. Ayres, 334 bags; Tupman Thurlow & Co., Inc., Hardanger, B. Ayres, 917 bags; D. C. Andrews & Co., Deutschland, Hamburg, 70 bags.

WOOD PULP

Castle & Overton, Inc., Veendam, Rotterdam, 570 bls. wood pulp; A. Giese & Son, Veendam, Rotterdam, 30 bls. wood pulp; M. Sone, Saturnia, Trieste, 1,792 bls. wood pulp; E. J. Keller Co., Inc., Washington, ———, 336 bls. wood pulp; ———, Roxen, Wiborg, 8,502 bls. sulphite; Lagerloef Trading Co., Roxen, Wiborg, 635 bls. mechanical pulp; Bulkley, Dunton & Co., Roxen, ———, 500 bls. wood pulp; M. Sone, Roxen, Gefle, 2,155 bls. sulphite; Price & Pierce, Ltd., Roxen, Wallvik, 900 bls. sulphite, 625 bls. mechanical pulp; Perkins Goodwin & Co., Roxen, Norrsundet, 1,250 bls. sulphate; J. Andersen & Co., Stavangerfjord, Sarpsborg, 300 bls. sulphite; Chase National Bank, Stavangerfjord, Oslo, 2,250 bls. chemical pulp; The Borregaard Co., Inc., Stavangerfjord, Sarpsborg, 168 bls. sulphite; National City Bank, Stavangerfjord, Halden, 150 bls. sulphite; J. Andersen & Co., Stavangerfjord, Oslo, 1,250 bls. sulphite; ———, Minnequa, Hernosand, 960 bls. sulphate, 160 tons, 900 bls. sulphite, 150 tons; ———, Minnequa, Stugsund, 1,750 bls. sulphite, 350 tons, 1,165 bls. sulphate, 233 tons; Johaneson Wales & Sparre, Inc., Minnequa, Sundsvall, 3,850 bls. sulphite, 730 tons, 750 bls. chemical pulp, 150 tons, 300 bls. sulphate, 50 tons; Mead Sales Co., Minnequa, Sundsvall, 250 bls. chemical pulp, 50 tons, 250 bls. sulphite, 50 tons; Castle & Overton, Inc., Minnequa, Sundsvall, 1,335 bls. mechanical pulp, 22 tons; Castle & Overton, Inc., Deutschland, Hamburg, 690 bls. wood pulp, 138 tons.

WOOD PULP BOARDS

Johaneson Wales & Sparre, Inc., Hofuku Maru, Hamburg, 266 bls., 52 tons.

ALBANY IMPORTS

WEEK ENDING SEPTEMBER 23, 1933

Atterbury Bros., Inc., Frode, Tofte, 4,200 bls. sulphite, 711 tons; Castle & Overton, Inc., Roxen, Wiborg, 3,849 bls. wood pulp; ———, Roxen, Wiborg, 1,244 bls. sulphite; Lagerloef Trading Co., Roxen, Mantyluoto, 1,233 bls. sulphite; Perkins Goodwin & Co., Roxen, Norrsundet, 2,125 bls. sulphite; Pagel Horton & Co., Inc., Roxen, Gefle, 7,750 bls. sulphite; J. Andersen & Co., Roxen, Stockholm, 300 bls. sulphite; Gottesman & Co., Inc., Roxen, Stockholm, 6,000 bls. sulphite.

PORTLAND IMPORTS

WEEK ENDING SEPTEMBER 23, 1933

Bulkley, Dunton & Co., Simon von Utrecht, ———, 3,500 bls. wood pulp; Bulkley Dunton & Co., Kolsnaren, ———, 3,200 bls. wood pulp.

BOSTON IMPORTS

WEEK ENDING SEPTEMBER 23, 1933

Ayres W. C. Jones Co., Britannic, Liverpool, 95 bls. cotton waste; ———, Britannic, Liverpool, 80 bls. rags; Tupman Thurlow & Co., Inc., West Calumb, B. Ayres, 1,251 bags casein; C. H. Powell Co., Black Eagle, Rotterdam, 63 bls. cottonwaste, 60 rolls straw boards; Paper Makers Importing Co., Black Eagle, Rotterdam, 400 bags china clay; G. W. Millar & Co., Inc., City of Flint, Glasgow, 37 bls. paper stock; E. Butterworth & Co., Inc., Artigas, Manchester, 89 bls. bagging, 279 bags hide clippings; International Paper Co., Grelhead, Dalhousie, 3,069 rolls news print; Parsons & Whittemore, Inc., Westerwald, ———, 125 bls. sulphite.

PHILADELPHIA IMPORTS

WEEK ENDING SEPTEMBER 23, 1933

———, City of Flint, Glasgow, 892 bls. waste paper, 256 bls. paper stock; Bank of N. Y. Trust Co., Artigas, London, 83 bls. waste paper; Bank of Manhattan Co., Artigas, London, 55 bls. rags; O. G. Hempstead & Co., Artigas, London, 40 bls. waste paper; W. J. Jones, Artigas, London, 193 bls. rags; Brown Bros. Harriman & Co., Artigas, London, 25 bls. waste paper; Lagerloef Trading Co., Minnequa, Wiborg, 7,630 bls. sulphite, 1,507 tons; Castle & Overton, Inc., Minnequa, Wiborg, 145 bls. wood pulp, 29 tons; ———, Minnequa, Hernosand, 300 bls. sulphite, 50 tons; Perkins Goodwin & Co., Minnequa, Norrsundet, 250 bls. sulphate, 50 tons; Atterbury Bros., Inc., Minnequa, Sundsvall, 150 bls. mechanical pulp, 25 tons.

WILMINGTON IMPORTS

WEEK ENDING SEPTEMBER 23, 1933

Atterbury Bros., Inc., Frode, Drammen, 2,950 bls. sulphite, 508 tons; Castle & Overton, Inc., Minnequa, Wiborg, 3,382 bls. wood pulp, 676 tons.

BALTIMORE IMPORTS

WEEK ENDING SEPTEMBER 23, 1933

———, Artigas, Liverpool, 120 coils old rope, 1 cs. tissue paper; Bulkley, Dunton & Co., City of Newport News, ———, 1,000 bls. wood pulp.

NORFOLK IMPORTS

WEEK ENDING SEPTEMBER 23, 1933

National City Bank, Artigas, London, 116 bls. rags; A. Brown & Son, Artigas, London, 14 bls. rags; ———, Artigas, London, 147 coils old rope, 380 bls. waste paper; ———, Artigas, Liverpool, 9 cs. tissue paper.

NEWPORT NEWS IMPORTS

WEEK ENDING SEPTEMBER 23, 1933

J. Andersen & Co., Frode, Tofte, 2,670 bls. sulphite, 452 tons; The Borregaard Co., Inc., Frode, Tofte, 4,500 bls. sulphite, 762 tons; Atterbury Bros., Inc., Frode, Tofte, 300 bls. sulphite, 50 tons.

NEW ORLEANS IMPORTS

WEEK ENDING SEPTEMBER 23, 1933

E. J. Keller Co., Inc., Saperino, ———, 719 bls. rags.

SAN FRANCISCO IMPORTS

WEEK ENDING SEPTEMBER 23, 1933

E. J. Keller Co., Inc., Kohwar Maru, ———, 500 bls. rags.

New York Market Review

Office of the PAPER TRADE JOURNAL,
Wednesday, September 27, 1933.

Trading in the local paper market was only moderately active during the past week. Demand for the various standard grades of paper was light. Sales forces of the leading paper organizations are still optimistic, however, and look for an expansion of business after the end of the month. Prices are generally steady and unchanged.

The outlook for the news print paper market is brighter. Advertising volume is increasing and consumption by the newspaper publishers is gaining. Production in the United States and Canada is being maintained in sufficient volume to take care of current requirements.

Steadiness prevails in the box board industry. Demand for box board is fairly persistent. Prices are generally well sustained. No further changes were reported in the fine paper market. Tissues are moving in good volume. The coarse paper market is rather irregular, although prices are firm.

Mechanical Pulp

The ground wood pulp market is fairly active. Manufacturing operations in North America and abroad are generally keyed to consumption and the statistical position of the industry is satisfactory. Recently advanced quotations on foreign mechanical pulp are well maintained.

Chemical Pulp

Although demand has fallen off slightly, the chemical pulp market is firmer. Imported easy bleaching sulphite is now quoted at from $2.10 to $2.20 and Mitcherlich unbleached at from $1.95 to $2.05, on dock, Atlantic ports. Domestic easy bleaching sulphite is selling at from $1.90 to $2.05 and news at from $1.85 to $1.95, f.o.b. pulp mill.

Old Rope and Bagging

The old rope market is quiet. Demand for both domestic and imported old manila rope is listless. Small mixed rope is dull. Old rope prices are holding up well, however. The bagging market is firmer, due mainly to the strength of foreign currencies. Roofing bagging is stronger.

Rags

Little change has transpired in the domestic rag market. Demand for new cotton rags is only fair at present, with the exception of No. 1 white shirt cuttings, which are going forward in good volume. Some improvement was also noticed in the request for roofing grades. Dark cottons are firmer.

Waste Paper

Board mill interest in the lower grades of waste paper has fallen off temporarily. Quotations on No. 1 mixed paper are easier. The higher grades of paper stock are mostly firmer. Stitchless flat stock is now quoted at from $1.10 to $1.15, overissue magazine at from $1.10 to $1.15 and solid flat book at from $1.00 to $1.10.

Twine

While demand for the various grades of twine has quieted down somewhat, the position of the local twine market continues satisfactory. Prices are generally well sustained and reports of shading are infrequent. The opinion is being very freely expressed that trading in twines will be to a marked extent lively during the closing months of the year.

C. W. Boyce Discusses Paper Code

Charles W. Boyce, executive secretary of the American Paper and Pulp Association, discussed the recent developments of the Paper Code at the regular weekly luncheon and meeting of the Eastern Division of the Salesmen's Association of the Paper Industry, held at the Woodstock Hotel, New York, on Monday last. There was an excellent attendance of salesmen and trade association executives, who deeply appreciated the address.

Mr. Boyce expressed the view that the working of the code would revolutionize the whole method of doing business in the paper industry and would lead to the equalizing of competitive methods. He predicted that price ranges would be narrowed and referred to the compulsory filing of price lists.

One of the most important features of the whole code, declared Mr. Boyce, was the provision for reporting statistics which would provide a nearly exact measure of the industry and would form the basis of information necessary for control.

Mr. Boyce mentioned that the Trade Customs and Practices were not provided for in the code, but will be submitted to the Administrator at a later date. He also stated that the policing of the code would be one of the major problems.

The speaker declared that the provisions of the code were of particular importance to the paper salesmen and that the test of the code would come in distribution, and pointed out that the Salesmen's Association would have a great opportunity of cooperating in the successful working of the measure.

Students Visit Paper Mills

MECHANICVILLE, N. Y., September 25, 1933—A group of forestry students from the Cornell University camp at Newcomb in the Adirondacks visited here last week and inspected the plant of the West Virginia Pulp and Paper Co. The trip was made under the direction of Prof. A. B. Recknagel, who has been prominent in forestry development for several years. Later the students visited the mill of Finch, Pruyn & Co., at Glens Falls, where they were guests of the company for luncheon. It was learned that this group of students who are making the trip are also spending several weeks in practical forestry work before returning for their senior year's studies at the Cornell University.

Miscellaneous Markets

Office of the PAPER TRADE JOURNAL,
Wednesday, September 27, 1933.

BLANC FIXE.—Conditions in the blanc fixe market are fairly satisfactory. The contract movement is normal. The powder is still quoted at from 3½ to 3¾ cents per pound, in barrels, at works; while the pulp is selling at from $42.50 to $45 per ton, in bulk.

BLEACHING POWDER.—The bleaching powder is fairly active. Contract shipments are going forward at a steady pace. Prices are holding to previously quoted levels. Bleaching powder is selling at from $1.75 to $2.00 per 100 pounds, in drums, at works.

CASEIN.—The casein market is listless. Domestic standard ground is quoted at 14 cents and finely ground at 15 cents per pound. Argentine standard ground is selling at 14 cents and finely ground at 14½ cents per pound, all in bags, car lot quantities.

CAUSTIC SODA.—Trading in the caustic soda market is brisk. Prices are holding to schedule. Solid caustic soda is quoted at from $2.55 to $3.00; while the flake and the ground are selling at from $2.95 to $3.00 per 100 pounds, in large drums, at works.

CHINA CLAY.—The position of the china clay market is practically unchanged, despite currency fluctuations. Imported china clay is quoted at from $12 to $17 per ton, ship side; while domestic paper making clay is selling at from $4.50 to $12 per ton, at mine.

CHLORINE.—Demand for chlorine from the paper mills is moderately active. The contract movement is fairly heavy. Prices are holding to schedule. Chlorine is quoted at $1.75 per 100 pounds, in tanks, or multi-unit cars, in ton lots, or over, at works.

ROSIN.—The rosin market continues firm. The grades of gum rosin used in the paper mills are now quoted at from $5.15 to $5.20 per 280 pounds, in barrels, at works; while wood rosin is selling at $3.90 per 280 pounds, in barrels, at southern shipping points.

SALT CAKE.—Business in the salt cake market is quite active. Prices continue firm. Salt cake is quoted at from $14 to $14.50; chrome salt cake at from $13.50 to $14 per ton, at works; while foreign salt cake is selling at from $14 to $14.50 per ton, on dock.

SODA ASH.—The soda ash market is exhibiting a strong undertone. Shipments against contract are moving regularly. Prices are firm. Quotations on soda ash, in car lots, at works, per 100 pounds, are as follows: in bulk, $1.05; in bags, $1.30; and in barrels, $1.43.

STARCH.—Paper mill demand for starch is fairly persistent. The contract movement is well up to average. Prices remain unchanged. Special paper-making starch is quoted at $2.84 per 100 pounds, in bags; and at $3.11 per 100 pounds, in barrels, at works.

SULPHATE OF ALUMINA.—Supplies of sulphate of alumina are moving into consumption in good volume. Prices are firm. Commercial grades are quoted at from $1.25 to $1.46; while iron free is selling at from $1.90 to $2.05 per 100 pounds, in barrels, at works.

SULPHUR.—The sulphur market is steady. Sulphur is quoted at $18 per long ton, on orders of 1,000 tons, or over, on yearly contracts; and at $20 per ton on any smaller quantity over that period. On spot and near by carloads, the quotation is $21 per ton.

TALC.—Steadiness prevails in the talc market. Contract shipments are proceeding regularly. Prices are unchanged. Domestic talc is quoted at from $16 to $18 per ton, in bulk, at eastern mines; while imported talc is selling at from $20 to $50 per ton, ship side.

Market Quotations

Paper

(F. o. b. Mill)

Ledgers	6.50	@	—
Bonds	6.00	@	—
Index	6.00	@	—
Writings—			
Extra Superfine	6.50	@	—
Superfine	6.25	@	—
Tub sized	5.75	@	—
Engine sized	5.50	@	—
Book, Cased—			
S. & S. C.	5.50	@	—
S. & S. C. Litho.	5.75	@	—
M. F.	5.25	@	—
Coated and Enamel	6.15	@	9.30
Coated Litho	6.90	@	—
Tissues—Per Ream—			
White No. 1	.60	@	.80
White No. 2	.55	@	.70
Anti-Tarnish M. G. only	.75	@	.80
Colored	.80	@	1.00
Kraft	.75	@	.80
Manila	.65	@	.70
Manila—			
No. 1 Jute	9.00	@	9.25
No. 2 Jute	7.75	@	8.50
No. 1 Wood	4.00	@	5.25
No. 2 Wood	3.50	@	4.00
Butchers	3.37½	@	—
Fibre Papers—			
No. 1 Fibre	4.25	@	5.50
No. 2 Fibre	4.00	@	4.75
Common Bogus	1.50	@	3.00
Screenings	2.00	@	3.00
Card Middles	4.00	@	5.00
Glassine—			
Bleached, basis 25 lbs., No. 1	.11	@	—
No. 2	.10	@	—
Bleached, basis 20 lbs.	.13	@	—
(Delivered New York)			
News, per ton—			
Roll, contract	40.00	@	—
Rolls, spot	40.00	@	—
Sheets	45.00	@	—
Side Runs	25.00	@	—
Kraft—			
No. 1 Domestic	4.75	@	5.00
No. 2 Domestic	3.62½	@	4.00
Southern	3.62½	@	4.00
Imported	Nominal		
Boards—per ton—			
News	45.00	@	50.00
Chip	42.50	@	47.50
Binders Boards	68.00	@	72.00
Kraft Liner	75.00	@	85.00
Standard 85 Test			
Jute Liner	50.00	@	55.00
Sgl. Mla. Ll. Chip	52.50	@	55.00
(F. o. b. Mill)			
Wood Pulp Board	70.00	@	80.00

Mechanical Pulp

(On Dock, Atlantic Ports)

No. 1 Imported—			
Moist	27.50	@	29.00
Dry	28.00	@	29.50
(F.o.b. Mill)			
No. 1 Domestic and Canadian	24.00	@	28.00

Chemical Pulp

(On Dock, Atlantic Ports)

Sulphite (Imported)—			
Bleached	2.70	@	3.00
Easy Bleaching	2.10	@	2.20
No. 1 strong unbleached	1.90	@	2.00
Mitscherlich Unbleached	1.95	@	2.05
No. 2 Strong unbleached	1.75	@	1.85
No. 1 Kraft	1.75	@	1.85
No. 2 Kraft	1.60	@	1.70
Sulphate—			
Bleached	2.75	@	3.25
(F. o. b. Pulp Mill)			
Sulphite (Domestic and Canadian)—			
Bleached	2.50	@	3.75
Easy Bleaching	1.90	@	2.05
News	1.85	@	1.95
Mitscherlich unbleached	2.25	@	2.50
Kraft (Domestic)	1.60	@	2.75
Soda Bleached	2.50	@	—

Domestic Rags

New Rags

(Prices to Mill f. o. b. N. Y.)

Shirt Cuttings—			
New White, No. 1.	6.50	@	7.00
Silesias No. 1	4.25	@	4.50
New Unbleached	6.75	@	7.25
New Soft Blacks	3.00	@	3.25
Blue Overall	4.25	@	4.50
Fancy	2.50	@	2.75
Washables	2.00	@	2.25
Mixed Khaki Cuttings	3.25	@	3.50
O. D. Khaki Cuttings	4.00	@	4.25
Men's Corduroy	1.50	@	1.75
New Mixed Blacks	2.50	@	2.75

Old Rags

White, No. 1—			
Repacked	3.75	@	4.00
Miscellaneous	3.00	@	3.50
White, No. 2—			
Repacked	2.00	@	2.50
Miscellaneous	1.75	@	2.00
Thirds and Blues—			
Repacked	1.75	@	2.00
Miscellaneous	1.50	@	1.75
Black Stockings	2.50	@	3.00
Roofing Rags—			
No. 1	.90	@	.95
No. 2	.80	@	.85
No. 3	.75	@	.80
No. 4	.70	@	.75
No. 5A	.65	@	.70

Foreign Rags

New Rags

New Dark Cuttings	1.50	@	1.60
New Mixed Cuttings	1.60	@	1.70
New Light Silesias	3.50	@	3.75
Light Flannelettes	3.25	@	3.50
Unbleached Cuttings	5.75	@	6.00
New White Cuttings	5.50	@	6.00
New Light Oxfords	3.25	@	3.50
New Light Prints	2.75	@	3.00

Old Rags

No. 1 White Linens	7.00	@	7.50
No. 2 White Linens	6.00	@	6.50
No. 3 White Linens	4.50	@	5.00
No. 4 White Linens	2.25	@	2.50
No. 1 White Cotton	3.75	@	4.00
No. 2 White Cotton	3.00	@	3.25
No. 3 White Cotton	2.50	@	2.75
No. 4 White Cotton	1.50	@	1.60
Extra Light Prints	2.00	@	2.25
Ord. Light Prints	1.75	@	1.85
Med. Light Prints	1.55	@	1.65
Dutch Blue Cottons	1.65	@	1.80
French Blue Linens	2.10	@	2.25
German Blue Linens	1.85	@	2.00
German Blue Cottons	1.35	@	1.50
Checks and Blues	1.30	@	1.40
Lindsay Garments	1.10	@	1.15
Dark Cottons	1.00	@	1.10
Old Shopperies	.85	@	.90
New Shopperies	.80	@	.85
French Blues	1.50	@	1.65

Old Rope and Bagging

(Prices to Mill f. o. b. N. Y.)

Gunny No. 1—			
Foreign	1.30	@	1.40
Domestic	1.25	@	1.35
Wool Tares, light	1.05	@	1.15
Wool Tares, heavy	1.05	@	1.15
Bright Bagging	1.00	@	1.10
Manila Rope—			
Foreign	2.50	@	2.75
Domestic	2.50	@	2.75
Small Mixed Rope	1.10	@	1.35
New Burlap Cut	1.50	@	1.75
Hessian Jute Threads—			
Foreign	2.60	@	2.75
Domestic	2.80	@	3.00

Old Waste Papers

(F. o. b. New York)

Shavings—			
White Envelope Cuttings	2.65	@	2.80
Ordinary Hard White No. 1	2.40	@	2.50
Hard White No. 2	2.30	@	2.40
Soft White No. 1	2.20	@	2.30
Flat Stock—			
Stitchless	1.10	@	1.15
Overissue Mag	1.10	@	1.15
Solid Flat Book	1.00	@	1.05
Crumpled No.	.85	@	.90
Solid Book Ledger	1.50	@	1.75
Ledger Stock	1.05	@	1.15
New B. B. Chips	.50	@	.60
Manilas—			
New Env. Cut	1.65	@	1.75
New Cuttings	1.20	@	1.25
Extra No. 1 old	.90	@	1.00
Print	Nominal		
Bogus Wrapper	.70	@	.80
Container	Nominal		
Old Kraft Machine—			
Compressed bales	1.15	@	1.25
News—			
No. 1 White News	1.20	@	1.30
Strictly Overissue	.75	@	.85
Strictly Folded	.70	@	.75
No. 1 Mixed Paper	.50	@	.55

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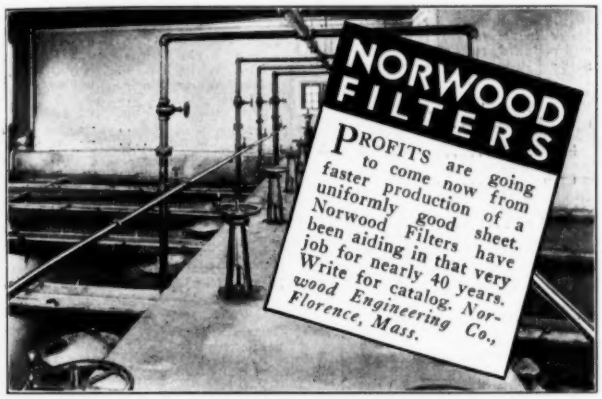
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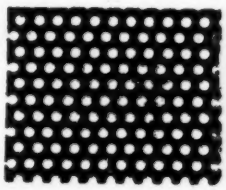

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Twines
(F. o. b. Mill)

Cotton—			
B. C. 18 basis	.30	@	.32
No. 1	.20	@	.22
No. 2	.19	@	.20
No. 3	.17	@	.18
A. Italian, 18 basis	.36	@	.37
Flaxseed Jute—			
Dark, 18 basis	.18	@	.20
Light, 18 basis	.20	@	.22
Jute Wrapping, 3-6 Ply—			
No. 1	.15½	@	.16½
No. 2	.15	@	.16
Tube Rope—			
4-ply and larger	.09¾	@	.11¾
Fine Tube Rope—			
4-ply	.13¼	@	.14¼
3-ply	.14¼	@	.14¾
2-ply	.15¼	@	.15¾
Paper Makers Twine	.08¾	@	.10¾
Box Twine, 2-3 ply	.12¼	@	.13½
White Hemp	.12¼	@	.15¼
Java Sisal—			
No. 1 Basis	.11½	@	—
No. 2 Basis	.10½	@	—
New Zealand Sisal	.11½	@	—
Sisal Lath Yarn—			
No. 1	.13½	@	.15½
No. 2	.11½	@	.13½
Manila Twine	.24½	@	.29½

CHICAGO

Paper
(F. o. b. Mill)

Rag Bond	.30	@	.53¼
Water Marked Sulphite Bond	.09	@	.12
Sulphite Bond	.09	@	.11
Superfine Writing	.18	@	.24
No. 1 Fine Writing	.14	@	.18
No. 2 Fine Writing	.12	@	.14
No. 3 Fine Writing	.07	@	.18
No. 1 M. F. Book	.06½	@	.07¼
No. 2 M. F. Book	.05¼	@	.06¼
No. 1 S.&S.C. Book	.06¼	@	.07¼
No. 2 S.&S.C. Book	.05¼	@	.06½
Coated Book	.07½	@	.12
Coated Label	.07½	@	.10
No. 1 Manila	.04¼	@	.05¾
No. 1 Fibre	.04¾	@	.05¼
No. 2 Manila	.04¼	@	.04¾
Butcher's Manila	.03¼	@	.03¾
No. 1 Kraft	3.50	@	4.50
Southern Kraft	2.62½	@	—
No. 2 Kraft	2.62½	@	—
Wood Tag Boards	.04¼	@	.06¼
Sulphite Screenings	.03	@	.03¾
Manila Tissue	.07	@	.07¼
White Tissue	.07¼	@	.07½

(Delivered Central Territory)

News, per ton—			
Rolls, contract	45.00	@	—
Sheets	50.00	@	—
Boards, per ton—			
Plain Chip	37.50	@	—
Solid News	43.50	@	—
Manila Lined Chip	47.50	@	—
Patent coated	55.00	@	—
Container Lined—			
85 Test	60.00	@	65.00
100 Test	60.00	@	70.00

Old Papers
(F. o. b. Chicago)

Shavings—			
No. 1 White Envelope cuttings	1.70	@	1.80
No. 1 Hard White	1.40	@	1.50
No. 1 Soft White	1.20	@	1.30
Ledger & Writings	.80	@	.90
Solid Books	.80	@	.90
Blanks	1.00	@	1.05
Krafts	.90	@	1.00
New Kraft Cuts	1.20	@	1.30
Manila Env. Cuts	1.25	@	1.30
Ex. No. 1 Manila	1.00	@	1.05
Print Manila	.60	@	.65
Overissue News	.60	@	.70
Old Newspapers—			
No. 1	.55	@	.65
Mixed Papers—			
No. 1	.50	@	.55
Roofing Stocks—			
No. 1	30.00	@	—
No. 2	28.00	@	—

PHILADELPHIA

Paper
(F. o. b. Mill)

Bonds	.04	@	.40
Ledgers	.06	@	.40
Writings—			
Superfine	.10	@	.18
Extra Fine	.15	@	.26
Fine	.15	@	.26
Fine, No. 2	.10	@	.25
Fine No. 3	.05½	@	.18
Book, M. F.	.04¼	@	.07
Book, S. S. & C.	.05	@	.07½
Book, Coated	.06	@	.16
Coated Lithograph	.06	@	.11
Label	.07	@	.11
No. 1 Jute Manila	.06	@	.10
Manila Sul., No. 1	.03	@	.06
Manila No. 2	.03	@	.05
No. 1 Kraft	.05¼	@	.06½
No. 2 Kraft	.03¾	@	.05
Southern Kraft	2.75	@	4.00
Common Bogus	.03	@	.04½

(Delivered Philadelphia)

News Print Rolls	46.00	@	55.00
Straw Board	40.00	@	45.00
News Board	37.00	@	45.00
Chip Board	40.00	@	45.00
Wood Pulp Board	70.00	@	85.00
Binder Boards—			
No. 1, per ton	75.00	@	80.00
No. 2, per ton	70.00	@	75.00
Carload lots	65.00	@	70.00
Tarred Felts—			
Regular	52.25	@	54.25
Slaters (per roll)	.84	@	.94
Best Tarred, 1-ply (per roll)	1.95	@	2.10
Best Tarred, 2-ply (per roll)	1.50	@	1.60
Best Tarred, 3-ply	2.00	@	2.25

Domestic Rags (New)
(Price to Mill, f. o. b. Phila.)

Shirt Cuttings—			
New White, No. 1	.03½	@	.04
New White, No. 2	.02½	@	.04
Light Silesias	.02½	@	.03
Silesias, No. 1	.03	@	.03½
Black Silesias, soft	.02½	@	.03
New Unbleached	.05	@	.05½
Washable, No. 1	.01½	@	.02
Blue Overall	.03½	@	.04
Cottons—According to grades—			
Washable, No. 2	.02½	@	.03
New Blue	.01½	@	.03
Fancy	.01½	@	.03
New Black Soft	.02	@	.04
New Light Seconds	.01½	@	.02
New Dark Seconds	1.50	@	1.75
Khaki Cuttings—			
No. 1 O.D.	.03	@	.04
No. 2 Mixed	.03	@	.04
Corduroy	.02	@	.03
New Canvas	.03½	@	.04½
New Black Mixed	.02½	@	.03½

Domestic Rags (Old)

White No. 1—			
Repacked	2.50	@	3.50
Miscellaneous	1.75	@	2.25
M. G.	3.00	@	3.75
Thirds and Blues—			
Miscellaneous	1.00	@	1.50
Repacked	1.50	@	2.00
Black Stockings (Export)	2.00	@	3.50
Roofing Stock—			
Foreign No. 1	.50	@	.75
Repacked	.70	@	.85

Bagging
(F. o. b. Phila.)

Gunny, No. 1—			
Foreign	1.25	@	1.50
Domestic	1.50	@	1.75
Manila Rope	2.00	@	2.25
Sisal Rope	1.25	@	1.50
Mixed Rope	1.00	@	1.10
Scrap Burlaps—			
No. 1	1.25	@	1.50
No. 2	.80	@	1.00
Wool Tares, heavy	2.75	@	—
Mixed Strings	1.15	@	1.25
No. 1 New Light Burlap	2.25	@	2.50
New Burlap Cuttings	2.00	@	2.25

Old Papers
(F. o. b. Phila.)

Shavings—			
No. 1 Hard White	2.30	@	2.40
No. 2 Hard White	2.10	@	2.15
No. 1 Soft White	2.15	@	2.20
No. 2 Soft White	1.15	@	1.25
No. 1 Mixed	.95	@	1.00
No. 2 Mixed	.75	@	.80
Solid Ledger Stock	1.50	@	1.60
Writing Paper	1.15	@	1.20
No. 1 Books, heavy	1.20	@	1.25
No. 2 Books, light	.90	@	1.00
No. 1 New Manila	1.65	@	1.75
No. 1 Old Manila	.95	@	1.00
Print Manila	.90	@	.95
Container Manila	.85	@	.90
Old Kraft	1.20	@	1.25
Common Paper	.50	@	.60
No. 1 Mixed Paper	.75	@	.80
Straw Board Chip	.70	@	.75
Binders Board Chip	.70	@	.75
Corrugated Board	.90	@	.95
Overissue News	.75	@	.80
Old Newspaper	.65	@	.70

BOSTON

Paper
(F. o. b. Mill)

Ledgers—			
Sulphite	.06	@	.12½
Rag Content	.12	@	.30
All Rag	.36	@	.52½
Bonds—			
Sulphite	.05½	@	.11
Rag Content	.12	@	.30
All Rag	.36	@	.65
Writings	.06½	@	.20
Superfines	.11	@	.31
Book, Super	.06	@	.09
Book, M. F.	.05½	@	.08½
Book, Coated	.08½	@	.18
Coated Litho	.09	@	.12
Label	.09½	@	.15
Jute Manila No. 1	.11	@	.13
Manila, Sul. No. 1	.04¾	@	.06¼
Manila, Sul. No. 2	.03¾	@	.04½
No. 1 Kraft	.04½	@	—
No. 2 Kraft	.03½	@	—
(F. o. b. Boston)			
Southern Kraft	.03½	@	—

(F. o. b. destination in carload lots, f. o. b. mill in less than carload lots.)

Common Bogus	.02	@	.02¼

(Delivered New England points)

News Print, rolls	44.50	@	—
Straw Board, rolls	.009	@	35.00
Straw Board in Sheets, basis 35s to 70s	—	@	40.00
Filled News Board	45.00	@	50.00
Chip Board	42.50	@	47.00
Chip Board (Creasing)	45.00	@	—
Single Manila Lined Chip	52.50	@	62.50
Single White, Patent Coated News Board—Bender	62.50	@	72.50
Wood Pulp Board	70.00	@	75.00
Binder Boards	62.00	@	75.00

Old Papers
(F. o. b. Boston)

Shavings—			
No. 1 Soft White	1.90	@	2.00
No. 1 Old Manila	.50	@	.60
No. 1 Mixed	.90	@	1.00
No. 2 Mixed	.75	@	.80
Solid Ledger Books	1.40	@	1.50
Overissue Ledger Stock	1.15	@	1.30
Mixed Ledgers	1.00	@	1.10
No. 1 Books, heavy	1.10	@	1.20
No. 1 Books, light	.80	@	1.00
Crumpled Stitchless Book Stock	.50	@	.60
Manila Env. Cuttings	1.25	@	1.30
No. 1 Old Manila	.95	@	1.05
White Blank News	1.20	@	1.30
No. 1 Kraft	1.10	@	1.15
Manila	.90	@	1.05
No. 1 Mixed Papers	.45	@	.50
Print Manila	—	@	.90
Overissue News	.80	@	.90
Old Newspapers	.75	@	.80
Box Board Chips	.45	@	.50
Corrugated Boxes	.55	@	.60
Screening wrappers	.75	@	.85

Bagging
(F. o. b. Boston)

Manila Rope—			
Foreign	—	@	2.35
Domestic	2.50	@	—
Transmission Rope	1.50	@	—
Mixed Strings	.65	@	.75
Jute Rope	1.00	@	1.15
Jute Carpet Threads	.65	@	.70
Gunny No. 1—			
Foreign	1.25	@	1.30
Domestic	1.20	@	1.25
Bleachery Burlap	3.00	@	3.25
Scrap Burlap	1.00	@	1.10
No. 1 Scrap Burlap	1.20	@	1.25
Scrap Sisal	1.10	@	1.15
Scrap Sisal for shredding	1.15	@	1.30
Wool Tares, heavy	1.15	@	1.25
New Burlap Cuttings	1.15	@	1.25
Australian Wool Pouches	2.50	@	—
Heavy Baling Bagging	1.60	@	1.85
Paper Mill Bagging	.85	@	.95
Bagging No. 2	.50	@	.60
No. 1 Burlap	1.75	@	2.25

Domestic Rags (New)
(F. o. b. Boston)

Shirt Cuttings—			
New Light Prints	.02	@	.02¼
New White No. 1	.05½	@	.06
New White No. 2	.04½	@	.05
Silesias No. 1	.04	@	—
New Black Silesias	.02½	@	.03
New Unbleached	—	@	.05½
Blue Cheviot	—	@	4.65
Fancy	—	@	.03¼
Washable	.02¼	@	—
Cottons—According to grades—			
Blue Overalls	—	@	.03¼
New Black, soft	.04	@	.04½
Khaki Cuttings	.03	@	.03¼
O. D. Khaki	.03	@	.03¼
Corduroy	.01¾	@	.02
New Canvas	—	@	.05
B.V.D. Cuttings	.05	@	.05½

Domestic Rags (Old)
(F. o. b. Boston)

Canvas	.04½	@	—
White No. 1—			
Repacked	3.00	@	3.50
Miscellaneous	2.00	@	—
White No. 2—			
Repacked	.01½	@	.01¾
Miscellaneous	.01½	@	.01¾
Twos and Blues	1.25	@	1.50
Thirds and Blues			
Repacked	1.10	@	1.25
Miscellaneous	.85	@	.90
Black Stockings	2.25	@	2.50
Roofing Stock—			
No. 1	.70	@	.75
No. 2	.55	@	.65
No. 3	.35	@	.45

Foreign Rags
(F. o. b. Boston)

Dark Cottons	.95	@	—
New White Shirt Cuttings	5.50	@	6.50
Dutch Blues	2.00	@	2.50
New Checks & Blues	2.50	@	3.00
Old Fustians	1.55	@	1.60
Old Linsey Garments	1.35	@	—

TORONTO

Paper
(F. o. b. Mill)

Bond—			
No. 1 Sulphite	.09¾	@	—
No. 2 Sulphite	.08	@	—
No. 1 Colored	.10¼	@	—
No. 2 Colored	.08½	@	.10½
Ledgers (sulphite)			
Ledgers, No. 1	.34½	@	—
Ledgers, No. 2	.25½	@	—
Writing	.09	@	.09½
Book—			
No. 1 M. F. (Carloads)	6.20	@	—
No. 3 M. F. (Carloads)	5.70	@	—
No. 4 M. F. (carloads)	4.75	@	—
No. 1 S. C. (carloads)	6.65	@	—
No. 3 S. C. (carloads)	6.20	@	—
No. 4 S. C. (carloads)	5.20	@	—
No. 1 Coated and Litho	12.00	@	—
No. 2 Coated and Litho	10.50	@	—
No. 3 Coated and Litho	9.50	@	—
Coated tinted	14.00	@	—
Wrapping—			
Rag Brown	4.25	@	—
White Wrap	2.00	@	—
"B" Manila	4.75	@	—
No. 1 Manila	5.25	@	—
Fiber	5.25	@	—
Kraft, M. F.	5.75	@	—
Kraft No. 2	5.25	@	—

(F.O.B. Cars Toronto)

News, per ton—			
Rolls (contract)	45.50	@	—
Sheets	50.50	@	—

Pulp
(F. o. b. Mill)

Ground Wood	18.00	@	20.00
Sulphite easy bleaching	40.00	@	—
Sulphite, news grade	38.00	@	—
Sulphite, bleached	50.00	@	55.00
Sulphate	50.00	@	—

Old Waste Paper
(In carload lots, f. o. b. Toronto)

Shavings—			
White Env. Cut	2.00	@	2.10
Soft White	1.60	@	1.90
White Blk. News	1.25	@	1.50
Book and Ledger—			
Flat Magazine and Book Stock (old)	.90	@	1.00
Light and Crumpled Book Stock	.80	@	.90
Ledgers and Writings	1.00	@	1.05
Manilas—			
New Manila Cut	1.25	@	1.50
Printed Manilas	.55	@	.80
Kraft	1.25	@	1.50
News and Scrap—			
Strictly Overissue	1.00	@	—
Strictly Folded	.85	@	—
No. 1 Mixed Paper	.70	@	—

Domestic Rags
(Price to mills, f. o. b. Toronto)

No. 1 White Shirt Cuttings	.05¼	@	.05½
Fancy Shirt Cuttings	.02¼	@	.02½